$2.00 per Year. 25 cts. per Copy.

AMERICAN JOURNAL OF PHOTOGRAPHY

AN ILLUSTRATED MONTHLY
DEVOTED TO PHOTOGRAPHY IN ITS WIDEST SENSE

Vol. XVIII. MAY, 1897. No. 209.

CONTENTS.

Subscriptions received in London, by Trübner & Co., 57 Ludgate Hill.
Agent in Germany, G. Hedeler, Grimmaischer Steinweg 3, Leipzig.

PHILADELPHIA:

THOS. H. McCOLLIN & CO., PUBLISHERS,

No. 1030 ARCH STREET.

Entered at the Philadelphia Post-Office as second-class matter.

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WILLIAM H. RAU, PHILA

THE WASHINGTON MONUMENT,

FAIRMOUNT PARK, PHILADELPHIA.

ERECTED BY THE PENNSYLVANIA SOCIETY OF THE CINCINNATI.

INTERNATIONAL ENGRAVING & ILLUSTRATING CO.

PHILADELPHIA.

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AMERICAN JOURNAL

OF

PHOTOGRAPHY

THOS. H. McCOLLIN, Managing Editor.

JOHN BARTLETT, Editor.

VOL. XVIII. MAY, 1897. No. 209

HAS THE BRAIN A PHOTOGRAPHIC FUNCTION.

THE study of the phenomena of vision, although it has no direct bearing on photography, is not altogether foreign to it, and some considerations, therefore, of a peculiar sort of visual impression connected with personal experience, may be of interest if it is not of special value to the photographer who has a scientific turn of mind.

The impressions upon the nerve fibres of the retina, of whatever nature they may actually be, bear a very close analogy to those upon the sensitive film. A picture is certainly formed there, which endures for an appreciable time, but whether this picture is directly impressed upon the cerebral substance, resulting in what we call conscious vision, cannot be as yet determined. Impressions once made and seemingly obliterated may be redeveloped, as we say, photographically, by the stimulus of some corporeal disturbance, in much of their original vividness and reality ; but it would be a difficult question to determine whether in the revolution of the cerebral phonograph, an image is again impressed on the retina, resulting in vision by the reverse or reflex action. The writer sees no reason why the nervous matter of the retina as part of, or in direct communication with the brain, should not facilitate the flow of the nervous current to itself.

I suppose most of us have had personal experience of the sort

of appearances known as ocular spectra, produced by the impression of a strong light on the retina, and which force themselves, sometimes very obnoxiously, upon us, even when we endeavor to shut our eyes against them.

However, when they are moderate in their action they are an enjoyable study, passing through many singular and beautiful phases, and presenting a highly orderly and harmonious arrangement of form and color.

The seat of these spectra is undoubtedly the retina, but whether they originate there or are propagated thither from the brain, would be hard to say. Light or some extraneous disturbing force, it would seem, is necessary to act first upon the sensitive end of the optic nerve—but are we to attribute their production to molecular disturbance in the retina itself, or is the retina stimulus the exciting cause for the cerebration ? Perhaps their production is part of that photographic process by which light acts chemically upon the retinal structure and of the gradual restoration of that organ to its normal state of resensitiveness by the fading out of the pictorial impression. It is for this reason that I think the personal experience may be of interest to photographers, or, in fact, to anyone.

But how are these impressions made upon the retina ? Are they projected from something without, or are they mentally evolved ? We see the things in space like any other material things, but are they externalities ? Are they not really objects in the mind's eye, though actually on the retina ? I do not mean purely subjective and visionary, but rather a product of the brain. There are certain peculiarities about these spectra which make them essentially different from visions of a disordered mind. Often they have definite geometric outlines, and frequently form intricate patterns, like the figures on a Turkish rug. The lines are sometimes dark on a light ground, and sometimes the reverse; negatives and positives of the same pattern. Sometimes they are very complex and most beautifully graduated in color. They change form from instant to instant, and do not admit of a very close study, even sufficient to depict them rapidly, else they might be quite a boon to anyone in the carpet trade; however, they

always change on a systematic principle, and seem to have a law governing their formation not unlike the systems of crystalization, each succeeding one being a variety or modification of its predecessor. They have a sort of fixed axis about which the transformations take place. It seems as if the agency, whatever it may be, had a very definite plan, and a consciousness of what it is doing, however much concealed from our knowledge. This definiteness is an evidence, I think, that they are not the product of a disturbed intellect. There is no co-ordination of the action in hallucinations. They are not the reproduction of objects recently seen, or, probably, ever seen before, but are quite novel in their structure and unexpected in their plan of presentation, and might, as I have said, be advantageously employed, could they be detained long enough to catch their fleeting beauties ; for no effort of the will can fix them. They have an uncontrolable freedom of their own will, and take a sort of malicious advantage of it in changing the combinations. I have frequently tried to determine their shape by an effort of the will, but they changed —" into something far more rare and strange "—than my imagination had the power of conjuring up. They appear to be painted on dark space or on light space by some invisible, dextrous artistic hand.

I shall not dwell longer on this part of the subject, though I know I could make it most interesting by more accurate description, and even attempts at reproduction of some of the forms which vaguely float before my visual memory, my purpose being merely to direct attention to a particular phase of the phenomena which some might be inclined to call hypnotic vision, and dismiss the whole subject with a sneer, and who can answer a sneer ?

These impressions about which I shall speak are not so vivid or eye-hurting in their manifestation as the ocular spectra, but may be studied with quite as much wide-awake observation. Indeed, when they present themselves, as they frequently do, quite unexpectedly, and wholly independent of the will power, they cannot be distinguished from actual visual impressions, and the beholder has not the least doubt, for the time, that he actually sees them—and does he not ?

Though independent of the will they do not persist long, but longer time than the geometric figures, dissolving slowly like dissolving views of the magic lantern. I have frequently, when sitting in a room, tried to make forms accordant to my fancy, but no—like Glendower—I might " call spirits from the vasty deep " but " they would not come when I did call them." They presented always something entirely different, so unexpected, so delightful, that I suppose the desire to revel in the enjoyment of them weakened the will power to control their formation. Like the ocular spectra patterns, some invisible, ingenious painter seemed to be embodying them.

Most people are not aware that they possess, more or less, the power of seeing forms and faces in the dark, not in absolute darkness, but when a faint gleam of light is present. People not by any means visionary have told me of the possession of this faculty, for it is a faculty, in many cases a source of amusement and delight when one is in perfect health and of buoyancy of spirits, but under depression of mind their occurrence may be unwished for on account of their incongruity; "the mind in grief," I suppose, "being pleased best with grief's society." Though sometimes humorous in my case, they have never been of a hideous character, but they are so persistent, so self-willed, so obtrusive, that sometimes I would say, "Take any shape but that."

Though produced involuntarily, they continue long enough in a definite shape and relation, and can, in a measure, be studied from different points of view, each angle of view, strange to say, changing the play of light and shade most beautifully just as in a real object.

The vision of landscape (I ought not to say vision, but rather presentation) is not as frequent in occurrence as the sight of faces and forms, but the landscape is always more distinct, and seemingly, more real, though subdued in a soft, peculiar light.

"A light that never was on sea or land."

The contemplation of these scenes is most delightful, the play of light and shade varying with every shifting of the eye. It is this peculiarity which would persuade us that they are real. It is only when judgment comes to our aid that we know them to

be—I was going to say—" the unsubstantial fabric of a dream," but these impressions are waking impressions, not dreams : call them waking dreams, if you will, but account for them other than referring them to a proximate cause.

Had I the power of the poet, I could delight you with a description of some of these wonderful pictures which have so presented themselves, and had I only the skill to portray these impressions I might shine as an ideal painter, but unfortunately, I have not " the faculty and art divine," but I think the great painters must have possessed this faculty coupled with the gift to hold and fix these impressions.

I remember that Goethe speaks of his delight in something similar.

So intensely on one occasion was a landscape presented to my view that I believe I would have directed my camera at it with the purpose of securing it—

> " So pure the sky, so quiet was the air,
> So like, so very like, was day to day !
> But when I looked no image still was there,—
> It trembled and it softly passed away.

How can we explain this strange phenomenal vision ? The objects were as real, and seemingly as palpable, as any I now behold.

> " If I stand here, I saw them."

By what means was the substratum of real landscape obliterated by the superposition of the sensorial ? What a maze we would get into if we should attempt to explain the connection between bodily and mental, or spiritual organism, but what a wonderful study it does open.

Is there some intelligence working upon our organization distinct from that of our own personality, whether external or resident in us ? Or can the phenomenon be explained in physical terms as a quasi-image formed on the retina by the sympathy of the nerve fibres with the brain, and their impressions delivered back to the sensorium as that of a reality ? Or there may be another solution : Has the sensorium the power to combine, symmetrically, separate elements, independent of the will, to the

formation of definite patterns or scenes ? Or, still another : Are these impressions, as Galton and Spencer would say, hereditary concepts ?

To produce a regular, symmetric arrangement of lines and angles and a disposition of colors for the formation of a distinct pattern, subject to geometric rules, and in accordance with the law of harmonious color, seems to imply a conscious producer.

We must acknowledge that every event has a cause, yet if the human will is subject to what appear to us the caprices of a more powerful will, the question of man's responsibility comes in to be accounted for. Theologians and philosophers have generally maintained that man is a moral agent, and that he has perfect freedom of the will, else man becomes a mere conscious automaton, controlled by an overpowering environment ; but what determines the will to a choice ? Especially is the question involved when there is no predisposing bias to determine the direction of choice.

The mind is a wonderful, mysterious entity; a spiritual essence, we may be justified in calling it. The impact resulting in visual perception is a physical manifestation and as much a molecular disturbance, whether external or internal, and reflex in its action as the impact of light upon a sensitive plate. The whole subject is one worthy of study from a physical standpoint, and should not be dismissed with the injunction to the narrator :

> "A solemn air and the best comforter,
> To an unsettled fancy, cure thy brains ;
> There stand, for you are spell-stopped."

HEADS AS FLOWERS.—Some very attractive novelties can be introduced by printing heads on leaves or as flowers upon various plants. This, it is obvious, can easily be accomplished by the use of combination printing, all that is required being a negative of the plant with the stalks, but without the flower, and some portrait heads with a frill or other light drapery around the neck. By first printing the heads to correspond with the stalks of the plant several can be added upon the same picture.

PRESENT STATE OF THE SOLARIZATION PROBLEM.

THE subject of solarization and halation is a very difficult one, and we are hardly nearer the solution of it than we are to that of the problem of the nature of the latent image, but it is fraught with so much interest, involving so many undecided questions in physical optics, that the photographic investigator is glad for any step towards elucidation. The *Photographisches Archiv* has an interesting paper on solarization by Julius Raphaels, which we translate for the benefit of our readers who regard the theoretical as well as the practical aspects of photography.

For the normally exposed gelatine plate metallic silver is deposited proportionally to the intensity of illumination in the formation of the negative image. But when the exposure to light is greatly prolonged we have on the contrary a positive image formed. We call the reversal solarization. A satisfactory explanation of this phenomenon, notwithstanding it has engaged the attention of the most eminent photographic chemists, has hardly been advanced. I therefore am of opinion that it may be of interest to the workers in the science to have presented to them the facts of the present condition of the problem.

What is our knowledge so far of this important subject? Is the question to be referred to the primary action of the light, or to the action of the developing solutions? Does the light act in first reducing the silver bromide, and then on the products of reduction? Or has the developer the power to produce the reversal?—that is, after a brief exposure to light.

If the exposure is very long a negative is first produced which is, by continued action, transformed into a positive. By adding certain ingredients (for example, hyposulphite of soda) to the developer one is enabled to produce, even with normal or under-exposure, a positive image. This might incline one to think that the developer plays the most important part in the process. But, on the other hand, it is to be observed that in printing on chloro-silver paper, where the operation is long continued, a

reversed image is produced. Besides, solarization takes place in physical development, which is fundamentally different from chemical development.

If a bromo-silver gelatine plate is exposed under a negative in an ordinary printing frame for several minutes to daylight, a weak, greenish-gray positive is formed. No sign of reversal, notwithstanding a long continuation of the exposure, is to be observed.

The question whether the light after a very long exposure would really act as an oxidizing agent upon the chloride of silver paper, is not conclusively decided as yet. The reversal takes place more readily when collodion is the medium for suspension of the silver salts than when gelatine is the substance. Addition of an organic acid favors it.

An analogous effect is probably that produced upon a mixture of starch and iodide of potassium, which turns blue in the light. Iodide of starch, thus formed, is, upon the other hand, bleached by the agency of light.

Papers prepared with some of the salts of iron present likewise phenomena which suggest behavior analogous to solarization. Prints made on paper impregnated with oxalate of iron have the salt reduced by the light, and if treated with silver nitrate the blue image formed is transformed into black. But if the exposed paper is kept in the dark for some time it is not acted upon by the silver. The reduced iron salt has become again oxidized (*Photo. Archiv.*, 1894, p. 321) and if in this condition is not any more sensitive, so that one obtains on application of the silver nitrate a reversed image on again exposing it entirely to the light.

The reversed image obtained by abnormal development of a short exposed plate is essentially different from that which is evolved by longer exposure and normal development. Whilst in the latter case only the usual black modification of the metallic silver presents itself, in the former there are present the two modifications, viz., the black and the red. We have, so to speak, a sort of mongrel before us,—a plate which simultaneously will yield a black, thin negative image, or a dense red positive.

Liesegang has treated this phenomenon, which he calls pseudo-solarization, because it is essentially distinct from the ordinary solarization (cf. *Photo. Archiv*, 1895, p. 300.) The positive image mentioned above is in reality only an intensified red fog, caused by the reduction of a soluble silver salt to the form of red metallic silver.

Chloro-silver gelatine development paper (without excess of silver nitrate) gives a green image on short exposure. The longer the exposure under the same negative the more the tone of the developed image tends to red.

It was formerly believed that the light according to the time of its action caused the different modifications. This view has been proved to be incorrect. It depends solely on the duration of the development. This is practically determined by the time of exposure, inasmuch as the operator must remove the long-exposed sheet of paper much sooner from the developer than the short-exposed. If it was truly dependent only upon the effect of the light, the print would exhibit double tones; but such is not the case.

Quite similar is the action with gallic acid (physically) produced chlor.-silver paper, which contains free silver nitrate and is more liable, therefore, to copying out. By long development red is produced ; by short, green.

As Liesegang has pointed out, in a short-exposed plate the light has not had time for sufficient intensity to penetrate the opaque film of silver bromide to tne glass beneath; hence, in development, no blackening of the deep lying portions is effected. The image lies only on the surface, and is therefore weak.

With normal exposure, on the contrary, the deeper lying layers of the silver bromide film receive sufficient molecular disturbance by the light to respond to the influences of the developer right to the glass substratum. On examination of the negative from the back it will be observed that the image has penetrated.

If a strongly over-exposed plate is subjected to the developer, there is likewise found at once, on the very upper surface, a

positive image which acts as a hinderance (a fine impenetrable film) to the penetration of the developer. In the less exposed parts the developer can continue its action. In proof of the formation of such an impenetrable superficial film, I quote the following: I exposed a plate upon a landscape, the camera facing the direct image of the sun. The disc which the sun produced was still not entirely solarised. On washing after the fixing a very decided blister made its appearance over against the sun image, whilst the film over the other exposed parts of the negative showed no indications of blistering and remained firmly attached to the glass.

As the developing was done with hydrochinone the phenomenon could not be attributed to the action of the products of oxidisation. It is probable that an analogous diffusion action plays a part in the production of the reversed image. But of the character of the image on the back we have as yet no positive conclusions to advance. In the case of long exposed plates, however, which have not been solarized, the negative first makes its appearance on the back of the plate when placed in the developer, but quickly changes completely into a positive. Besides it is worthy of observation that the secondary positive on the back advances to the front, therefore it is not reversed, as one would naturally have expected theoretically.

This phenomenon is strikingly illustrated in the production of weak prints on Aristo paper. If the print is allowed in contact with the developer too long an intense black positive image is formed on the back of the paper, whilst the image on the front is brown. Both images are metallic silver. Gradually the black image on the back penetrates to the front.

The whole subject of solarization is worthy the attention of scientific investigators, as it may reveal many unexplained phenomena in the chemistry and physics of photography.
and look to our methods of manipulation for securing permanency as well as brilliancy.

PERMANENCY OF PRINTS DEPENDENT UPON THE METHOD OF PRINTING.

J. STEINFURTH.

IT IS generally stated that the cause of the fading of silver prints is to be traced to the imperfection of the toning and fixing baths, but I have recently come to the conclusion that the character of the print itself, before the toning or fixing has a chance to influence it, in all probability affects the permanency of the silver albumen as well as the Aristo paper positive.

On examining a number of photographs printed several years ago, all made upon the same paper and toned and fixed in the same solutions, I was surprised to find that some had almost entirely faded out whilst others looked quite fresh and new. I reasoned, I know not whether correctly or not, (at least it will do no harm to give utterance to it), that if some had survived the ravages of time, why had others, coeval, fallen into the " sere and yellow leaf ? " Must not the fading be attributed to the nature of the image impressed on the sensitive paper prior to the toning and fixing operation? And so I began to think wherein consists the difference in the nature of the image.

On ventilating my ideas to a brother printer, a veteran in the business, I found I had an associate. His experience stretched further back than mine, and he showed me prints made by the old *Sel d'Or* process, on very thin albumen coated paper, in which, as you know, sulphur is said to be liberated from the combined acid hypo-and-gold bath in which the prints are fixed and toned, like that recommended for Aristo papers.

The sulphur toning has always been looked upon as the accelerator par excellence of the fading, and so one might naturally expect to find in prints that were at least a quarter of a century old nothing but ghost-like semblances of the pristine originals, but I was surprised to see many of them still quite brilliant. Some, it is true, were pale and wan-looking, but I was told that in all probability these were made exactly according to the same formulæ as the vigorous ones. All this seemed

to hold up the hands of my theory that the formulæ of toning and fixing should not have all the anathemas hurled at them for the fugitiveness of the print, and maybe the evanescence of the aristo-photograph may also be laid at the door of the printing, *per se*, as emanating directly from the printing frame.

It is well known that there is no absolute assurance that a so-called brilliant negative will yield a rich print. On the contrary, what is called a plucky negative, the acquisition of which is the pride of many a photographer, not infrequently disappoints his expectations by the indifferent character of the print or positive, while a comparatively thin, so-called weak negative, by judicious printing gives a most artistic and beautiful picture, rich in half-tones, soft in high lights, and delicate in shadows.

It is the ambition of some manipulators to obtain brilliant negatives, but as the negative is only one of the instruments, like the camera and lens, for obtaining the final result of photography, a beautiful picture, it may be wiser to lay less stress on good chemical effect and more on artistic merits of final results.

Some negatives which are truly of that character to give the best results, artistically, in the print, are seldom of a temperament to stand printing in the strong, direct rays of the sun. Frequently the best character of negatives deceive as to their merits at the first glance. Viewed through they present a rather weak appearance, but when viewed so that the image falls against a white sheet of paper we are delighted with the wealth of gradations reached.

A scale of gradations is there, from high to low, and the contrast is relatively correct.

Such negatives we are compelled to print in the shade to get the proper tone values. But here comes in the application of my views on permanency.

I believe that negatives of this latter class, although they give good prints by judicious manipulation, are the ones which are the most prone to fade.

The prints from the strong negatives are the result of exposure to a strong sun, and this continued action of light on the silver salt is a predisposing influence to secure their permanency.

We might be justified in saying that irrespective of methods of production the tendency of the fading of prints is directly in proportion to the thinness of the negative employed, or in other words, the stronger the impression secured the less liability to fading.

How we hailed the Aristo paper on its advent, for its special virtue of giving beautiful prints from negatives of such thinness that a good result on albumen from the same would be despaired of. One is often surprised at the artistic qualities obtained on this paper with weak negatives. Indeed, many to accommodate the character of their negatives to the peculiarities of this paper, not only purposely made their negatives thin, but even altered the style of their illumination.

It may be well to say here what is properly meant by a strong negative. Of course, one has no reference to the cast-iron subjects which beginners thrust into our hands, which require a day to get impressions from, but those which have brilliant high lights and deep shadows as well as rich intermediate tones, and which require a reasonable time to print in a strong light.

The light has a chance to penetrate the sensitive surface and give more body for the gold to act upon.

The Aristo-print is right on the surface, and is more brilliant on this account, but, from the nature of things, more fugitive ; and this inclination to fading is accelerated when the printing is done quickly.

When we have a weak negative from which we desire a good print on albumen, we strive to keep the image on the surface with the employment of extra albumen film and stronger silver solution, but when the print is sought from a strong negative, we are compelled to use a weaker bath of silver nitrate, and the image penetrates further into the film, and we are not afraid of poor results, because the brilliancy is in a great measure insured by the strength of the negative. It is reasonable to suppose that a superficial image would yield sooner to the action of light, or whatever the fading agent may be, than one of a depth which frequently penetrates to the paper substratum.

While, therefore, acknowledging that improper toning and

fixing are contributory to the degeneration of prints, we think it no sophistry to say that the nature of the silver deposit affected by the light, dependent upon the character of the negative interposed, has the major credit or responsibility for the permanency or fugitivity of the print. Let us, therefore, not sweepingly declare that the Aristo papers are to be consigned to the limbo of desuetude because in our inexperience we failed to secure permanency, but rather let us encourage the labors of those who are striving to perfect this excellent and flexible medium for printing,

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A MAGIC GROUP.—I once made a deep impression upon an old lady by showing her a group of her sons and daughters containing the full-length portrait of a son in India, who had not been in England for thirteen years. He left England a slim youth with a smooth and beardless face, but there he was in the group, a fine, broad fellow, and "bearded like the pard"—"The very image of the likeness they had just received from India," so the old lady said. Her son had not been in England, nor had his brothers and sisters been in India, and she was puzzled to account for his appearance in the group. I did not attempt the hopeless task of explaining the mystery, but left the old lady to believe that I possessed the powers of the Mahatmas, and could remove some fourteen stone of humanity through space, without expense, by a mere exercise of will-power, photograph the same, and return it, carriage paid, to India.

The manner in which I actually accomplished the feat was, first, to select a man having the general appearance of the absent son and to photograph him in the group with the others. In the negative the stranger was decapitated without mercy, and the head of the son—copied from a head-and-shoulders portrait taken in India—placed upon the shoulders by combination printing. The result was entirely satisfactory, and very few could detect the trick.—*J. A. Randall in Photo. News.*

ON PHOTOGRAPHING FLOWERS.*

IT has always seemed strange to me that pictures of flowers should form so small a portion of the varied displays at our photographic exhibitions, offering as they do one of the most delightful means of exercising one's taste, so beautiful in themselves, capable of such a variety of lovely combinations, and presenting so broad a scope to fancy. We have in them all the elements, pliable enough, and subject to our will. True, we cannot rely upon the ordinary sensitive film to fairly set forth the colors in their true tone relations as they appear to the eye, and hence cannot, like the painter, arrange our flowers for lights and shadows, irrespective of color, knowing that the photograph will invert the relation ; yet Nature is so lavish in her largess of gradation of the same color that we have sufficient scope in selection to render almost a counterfeit presentment.

Look at the almost infinite varieties of yellow and red in flowers, from which one may choose just that tint which shall correspond to the true tone he desires to represent in his photograph. We can secure almost any shade of gray. Blue, even in its darker hues, photographs, as we all know, much above its actual true tone, and so blue flowers take white or pale gray, and may therefore be harmoniously grouped with the white flowers in the modulation of the high lights. The very dark blue flowers, the dark purples, the violets and pale buffs, together with pink and tea roses, make a rich variety of pleasing half-tones.

A little experience teaches us just the shade a color will take, which of course varies with the amount of light to which it is exposed. For instance a dark blue flower will come out in the category of grays, towards the lighter shades, if exposed to a strong light, but placed in the shadows of other flowers it will appear much darker.

In the selection of white flowers, which are of course intended for the highest lights, we should give the preference to those

* Read before the Photographic Society of Philadelphia.

having the surface broken up to catch the shadows. The glaucous varieties,—I believe that is the term,—may be reserved for the shading off. But the smooth-surface flowers are just the thing for a single accentuated point of high light, which every picture ought to have, as well as a limited area of intense shade.

The whole effect of light and shade in a photograph,—that is, the standing out of one part from another,—is dependent upon the proper perception of the relativity of one tone with ancther.

If all objects were either black or white, this sense of judgment of tone would be comparatively easy of cultivation, but the variety of shades of color in objects, and the effects produced by reflection, demand a close and accurate study of things in relation to one another in order to appreciate harmony of light and shade. Not all of Nature's accidental combinations are equally beautiful. Some delight us more than others, but Nature never offends our sense of the beautiful by the discords we see in badly conceived paintings.

Really no object can stand isolated, or rather, we have our im-

"THE PLANT AND FLOWERS OF LIGHT."

J. WILL KELLMER, HAZLETON, PA.

pressions of things modified by surroundings, and it will be seen that haphazard association of objects, however beautiful individually, may affect us unpleasantly if they are not brought together with an appreciation of the principle of modification by juxtaposition. But as ordinary photographic methods do not properly render color values, the photographer along with his study of values must study the peculiar disposition of our sensitive film in its inability to correctly interpret Nature. He must, as it were, acquire an extra sense,—a photographic vision,—in order to secure harmony.

It is perhaps because one has by long practice come into possession of this faculty that one has litle recourse to the orthochromatic method.

I have employed the various color sensitisers in taking individual flowers with more or less success, but in groupings I have become so accustomed to arrange with a view to the photographic result that the orthochromatic method has often misled me, and given me flat, tame and unprofitable pictures.

I wish it to be understood that I am a believer in orthochromacy, and am grateful to those who have labored in this important field, but with all honor to the method I am inclined to think we often, in its application, repress too much the lower rays of the spectrum in exalting the upper, and make our photograph too uniform in tone,—too flat, as we say photographically. But this is the man, not the method, and doubtless orthochromacy produces very charming results.

Sometimes flowers are very arbitrary, so far as photography is concerned, in selecting for themselves two colors which do not take well together. The common field flower, for instance, with its centre of gold set round with milk-white rays,—the fav-

orite of the poets, but not of the operative photographer. The damascene white of the petals comes out, (with judicious management of exposure and development), in all its beauty, but the heart of gold, alas ! tarnishes. Here if anywhere the orthochromatic plate can assert its pre-eminence, and one would be foolish not to employ it if his design were to photograph individual flowers of the kind, or a bunch, but if they form members of a general group of flowers, I, at least, would prefer to dust a little powdered chalk upon the centres, or if Easter lilies are the subject, upon the anthers, until the deep yellow is diluted to the required paleness to give proper effect to the photograph.

We might say with Polixenes in " Winter's Tale," " It is an art which doth mend Nature, change it rather," but you retort

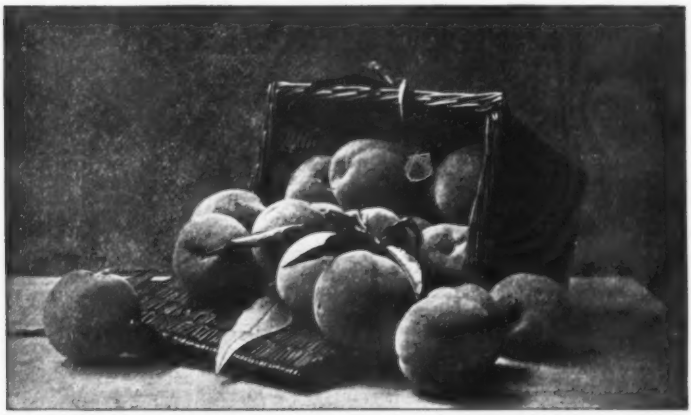
> " Yet nature is made better by no mean,
> But nature makes that mean."

The great aim in the arrangement of a bunch of flowers, or flowers in any grouping, is the proper massing of the lights and shades, and the avoidance of spottiness. Flowers offer great difficulties in their proclivity to make the picture have a spotty appearance, not always apparent to the eye. The alternation of light and dark flowers always gives unpleasant results. The grouping looks better when the arrangement of flowers is somewhat diagonally in two main divisions of light and shade, the transitions in each being gradual, the dark blending into the light and the light merging into the dark.

It is not difficult to secure proper massing if the foliage is called largely into service. There is an infinite variety in the shades of green, and the artist need not be as scrupulously exact as the botanist in giving each flower its own special leafage. He can draft into service any kind of foliage for beauty's sake.

After the arrangement of the shadows is complete, portions which need lighting up may be enlivened by wetting, so that more light is reflected, but have a care not to make a surface which gives a glare of light causing an aureole on your negative. Even dew-drops may be imitated by sprinkling with water in which a litle sugar or glycerine is added to give it a greater consistency, but be careful not to wet the background, if you do not want an unsightly spot on the fair surface.

It is a common practice to fasten the flowers against a wall by means of pins, but the careless grace of nature is better had by laying them upon a table or on the floor, and pointing the camera down at them. I learned this plan from a writer in the *British Journal of Photography*. I have found it a labor-saver, and the results are better. Only, we must take care not to get too much light from above on the whole group, which would cause flatness in the picture. A few trials in curtaining off the light so as to get contrasts will give the proper method of illumination. Generally the principal light should come from one direc-



tion only. This gives most pleasing shadows on the ground, and admirable relief to the flowers themselves,—sometimes almost stereoscopic effect. Cast shadows add wonderfully to the picture. A subdued light is better than a moderately strong one, but there should be illumination sufficient to give contrast.

I am an advocate of slow development for flower subjects, but this is a point to be decided by the photographer himself. Any tendency to harshness must be avoided, and so must tameness.

A variety of beautiful effects may be had by arranging the flowers in vases or urns. The background may be drapery, with gracefully disposed folds or plain. Scrolls, arabesques, or any

large figured designs look too obtrusive in so small a picture as a photograph.

Some care is needed in managing the light to prevent unpleasant reflections from the rounded surfaces of the vessels. But often these reflections are an added source of beauty, especially where glassware is employed. The reflection of the window-panes and the scenery add much to the interest and pictorial effect. Avoid also elaborate patterns in the vases. Plain vessels give much better contrast with the flowers.

One error we are apt to fall into at the beginning of our practice is in the possession of the idea that there should be a symmetric balance,—that the centre figure should be relieved by objects on the sides of equal proportions. You will very soon tire of such a disposal of things. It gets monotonous. There should be symmetry, but it must result from the balance of lines and masses of light and shade.

An object shadowed by another will naturally be darker in tone, and a dark thing will be relieved and brought out more prominently by being placed before a light one, which serves as its background, and so we can place objects in an appropriate setting with the exercise of a little judgment. Avoid overcrowding the picture. Too much detail detracts from the general interest. It is best to express our ideas in the fewest possible terms consistent with clearness.

A word in conclusion about photographing fruit. Spottiness is more difficult to get rid of in fruit subjects than with flowers. Sometimes it may be necessary to concentrate the light upon certain portions by means of card reflectors so as to get a proper contrast of light and shade. A bunch of grapes is very difficult to render properly; each grape catches the light, and cries out for individual attention, and so the massing of broad lights and shadows is difficult to secure. Perhaps the best results are obtained by arranging two bunches, one of a very dark variety, and the other of the light green kind. The contrast may be heightened by choosing suitable vine leaves and tendrils for a setting. The grapes may be laid upon a table and the light made to come in considerably from the side, so as to cast deep shad-

ows on the background, the dark variety of course being towards the shadowed side.

A judicious distribution of flowers with the fruit adds much to the picture, but they should be accessory only to the fruit,—not in any great abundance.

JOHN BARTLETT.

COPYING REFLECTIONS.—It is said the mirage has been photographed, and if the photographs are at all like the description of this optical illusion, a series of them would be both pleasing and beautiful, for the reflections from lakes and other smooth surfaces are sometimes more attractive than the sources from which they come. There exists an old Chinese myth that the reflections in water could be fixed by freezing. David Winstanley was inclined to believe in the possibility of such a feat. He even gave an instance of the images of a table and other things being found in a block of ice. Although we cannot fix reflections in the bodies from which they are reflected, it is an easy matter to fix them upon a photographic plate. In copying the reflections from a mirror many additions may be made by painting upon the surface of the mirror itself. This dodge is largely used by the makers of photo-mechanical blocks, and is not generally known. Supposing a reduction is wanted from a picture in which something is to appear not in the original, say a book, flowers, a dog, or even a background. The original is first reflected from a mirror, the desired addition is next painted upon the surface of the mirror in the exact position it is to occupy in the reproduction. The whole is then copied, and in the negative the painted objects come out as if actually in the original. Many of the curious combinations now seen in some of the illustrated journals making use of photo-mechanical processes are explained by this system. It is obvious that a similar method could be utilized for cutting portions out when copying, and it is strange that it is not in more general use.

GLYCIN.

HENRY WILSON.

WHY is Glycin so little favored by photographers . It surely deserves a better treatment, and is really one of the most energetic reducers we possess and at the same time capable of being employed in prolonged development without the slightest fear of encountering fog.

The writer has subjected negatives to its action for more than hour, going about other business and returning to find that he had a perfect, clear and beautiful result, full of detail and at the same time with considerable contrast.

It is hard to imagine why it is not a favorite. Even the well-known firm which has put it upon the American market seems to prefer advertising Metol and Hydrochinone.

The writer has not a word to say against the virtues of either of these agents, having tested their good qualities, but he would recommend Glycin to consideration, although he has no commercial interest in it whatever.

Glycin, it is true, is a rather tardy moving giant. It is not one of the three-league-booted kind that reaches its full power in a few minutes, but it should be hailed just for this reason for special purposes. Nothing equals it for developing undertimed negatives. By continued slow action (which need not interfere with other work) the utmost feeblest action of the light on the plate may be brought out much better than by dosing with alkali.

The following formula will be found excellent for undertimed plates : Take distilled water, 40 ounces, and dissolve in it Carbonate of Potassa, 770 grains; when solution is complete, add Glycin, 155 grains. The liquid will assume a light yellowish tinge. Finally add Sulphite of Soda, 470 grains.

The fresh developer is somewhat turbid, but in a day or two it becomes perfectly clear. The turbidity does not interfere in the least with its action, so it may be used immediately. It works slowly, as said above, but energetically, giving a good density, and by good we mean density that does not interfere with the

printing, and which gives in the print a good contrast. And besides the clearness will delight you.

For instantaneous exposures the same formula may be employed, only reducing the amount of water to 27 ounces.

Dilution, of course, increases the time of development, and if great softness is desired recourse should be had to it.

The solution may be used over and over again. It becomes however, brown, or rather, the color of cherry wine, but this does not interfere with its use. Indeed I have found that the old developer is excellent for bromide paper, diluted, of course. Instantaneous exposures ought always to be developed in fresh solution.

Glycin is specially adapted for development of negatives in which it is probable that the image has been produced in a harsh illumination. If it should be found that greater contrast is needed in the progress of development, add concentrated solution or remove the plate to a fresh developer containing less water.

The great claim of Glycin is its power to evolve detail, and in this respect I think it superior to Hydrochinone.

I have tried the addition of Metol, which accelerates the action, and in certain cases, have found it to work well. About 10 per cent. is sufficient.

The Glycin-Metol Developer works well with bromide paper, but I like the following better for enlargements. It is to be preferred to ferrous oxalate, as it does not endanger the paper with the stain from the iron salt, and gives as beautiful results.

First place the enlargement in the dish and wet it with water, pour off and flow old Glycin developer, and before any trace of the image makes its appearance, remove it to a tray containing diluted new developer. If it comes up too quickly, remove to the old developer. There is no danger of fog and no risk of discoloration, two things worth considering anyhow.

The proper color with Glycin is velvet black, as with Iron. Underdeveloped prints present a greyish tone. There is no need of Bromide of Potassium. Use dilute Hypo to avoid blisters.

I lately read in one of the German periodicals a formula by Baron Hübl, of Vienna, for rapid Glycin development. He em-

ployed : Concentrated Solution of Glycin, 3 drachms ; water, 4 ounces ; caustic soda, (1-10) 4 drachms. I found it to work rapidly, and it gave more contrast than the ones I have recommended, but the caustic soda played hob with my plates. It might be employed in case much contrast was wanted in the negative. If used it would be advisable to dilute it with equal bulk of water, but then this would reduce contrast. Better secure contrast by using one of the other developers; Pyro has never been excelled for this quality.

TRICK GROUPS.—Sometimes groups of persons are seen who have never met, and yet appear arranged and posed in a perfectly natural order, so that only experts can detect anything wrong. These are made in the following manner. A rough sketch of the group is first drawn, the position of the various figures and also the furniture being located. Each person is then photographed in the arranged position as opportunity offers; in one case that came under my notice this took many months, for the members comprising the group were scattered over the world. A suitable background is next chosen, a negative taken, and from that a bromide print made considerably larger than the intended picture. Other bromide prints are now enlarged from the separate negatives to match the background; they are cut out and arranged upon the ground in agreement with a designed grouping. The background is pasted upon cardboard, the figures pasted upon that, and when dry the joints and other defects are worked over with a suitable color. When finished the large bromide group thus made is reduced by copying to the size required, and prints struck off from the negative. The difficulty in this process is to obtain uniformity —firstly, in the separate negatives; secondly, in the bromide prints from them; and thirdly, between the background and figures.—*J. A. Randall in Photo. News.*

SELF-REGULATING X-RAY TUBE.*

DURING the past year this Society has listened to a number of papers on the general subject of X-Rays, and one or more on specially prepared plates for use in making radiographs. This evening I wish to dwell on only one part of the apparatus essential for making X-Rays, and that is the tube, and to describe and exhibit a new form, invented and worked out under the direction of Messrs Queen & Co., by Mr. H. Lyman Sayen, of their laboratory. Before referring to this particular tube, I will call your attention to the principal forms of tubes which have been and are being used.

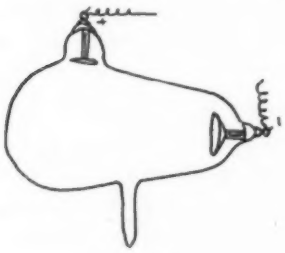


FIG. I.

FIG. II.

Roentgen in his original paper described a tube similar to the one now on the screen. (Fig. I.) As soon as Roentgen's discovery was announced, all institutions possessing collections of Crookes' tubes attempted to repeat his experiments, and in doing this a number of tubes essentially similar in design to this one were found to give good results. Strangely enough, neither Roentgen himself nor any one else for several months after the announcement of the discovery, used the tube which of all Crookes' tubes gives the best results. This is the so-called "Hot Platinum" tube, which was made by Crookes to illustrate the heating effect of the cathode rays. (Fig. II.)

* A paper read before the Photographic Society of Philadelphia, April 17, 1897.

Early in March '96 a new tube called the " Focus Tube " was announced from King's College, London, which was very evidently a modification of Crookes' Hot Platinum Tube. About the same time Herbert Shallenberger, of Rochester, announced that he had gotten very good results from Crookes' Hot Platinum Tube, and Dr. Goodspeed, of the University of Pennsylvania, took some excellent pictures with one in the collection of the University.

The figure now on the screen shows the modified form of Crookes' Hot Platinum Tube which has been very widely known as the Focus tube. (Fig. III.) Since its appearance no essential modifications have been made in the arrangements of the parts which have proven advantageous. A vast number of experiments have been made to better if possible the forms of tubes, but all have served simply to confirm the results of the experiments made at King's College.

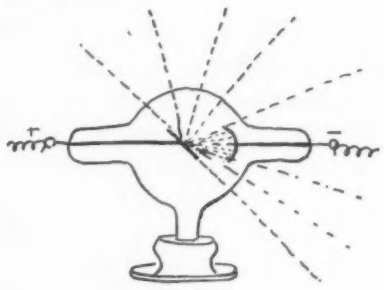


FIG. III.

The essential parts of the tube appear to be a cathode of such a shape as to focus the cathode rays on a single point on an anode, preferably of platinum. All other modifications which have been made are for regulating the vacuum rather than for changing the arrangements of these parts. The word " Focus " is often misused in connection with X-Ray tubes. Thus, one hears the expression in reference to a radiograph taken, " The focus was hit correctly." Now, X-Rays proceed from the point on the platinum where the cathode rays strike. The only possible focus in an X-Ray tube is determined once for all by the curvature of the cathode. If the maker gets his cathode accurately spherical and

the platinum at the focal point, the tube then gives sharp, clear pictures because the radiation comes from a single point.

The good qualities of X-Ray tubes depend, however, on more than a correct form. The tube must be properly exhausted, and, what is much more difficult, must be kept at a degree of exhaustion which may vary only in very narrow limits. After continuous use the vacuum in a tube gets higher. It is generally supposed that this is due to the occlusion of some of the residual gas by the metal parts, or to its sticking to the walls of the tube. Heating the walls of the tube by a lamp will drive out a certain amount of the occluded vapor, and temporarily lower the vacuum. If a tube is used with a powerful coil it is heated as the Crookes' Hot Platinum Tube, and this of itself drives out vapor and very considerably lowers the vacuum. These changes may be so great as to entirely prevent the formation of X-Rays, and if they are not this great they always decidedly change the character of the X-Rays.

A tube with low vacuum generates X-Rays of very much less penetrating power than a tube of higher vacuum. The rays generated by the low vacuum tube appear, however, to have greater photographic effect, and in making radiographs of such subjects as the hand, give a greater contrast between the bones and the flesh.

Very many devices have been suggested and tried to remedy these difficulties. I will describe three of the most prominent.

Crookes, in his lecture, describes a tube with a small bulb attached to it containing caustic potash, which was used to vary the degree of exhaustion. The vapor which the potash absorbs could be driven out of it by heat at will and the vacuum thereby lowered. This principle has been used by several makers of X-Ray tubes. A diagram of one of these tubes is now on the screen. When the vacuum of this tube is too high, the small bulb is heated with a spirit lamp and the vacuum reduced. A modification of this which has been suggested, is to surround the potash bulb with a small platinum wire, which is heated by means of an electric current from storage battery, or other suitable source, the amount of current to be controlled by a rheostat. (Fig. IV.)

Dr. Morton, of New York, suggested the addition of an incandescent lamp bulb in an auxiliary tube. The filament of the incondescent lamp bulb acted in much the same way as the wire in the last tube described; the current flowing through it was controlled by a rheostat and the heat given off by it lowered the vacuum of the tube. (Fig. V.)

One of the most ingenious of these devices was that recently put on the market by Siemens & Halske, of Berlin. This tube

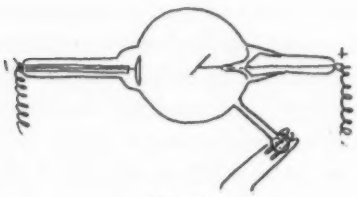


FIG. IV.

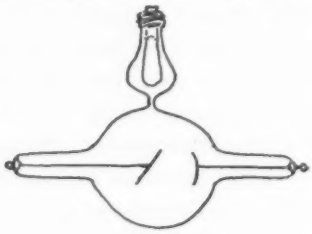


FIG. V.

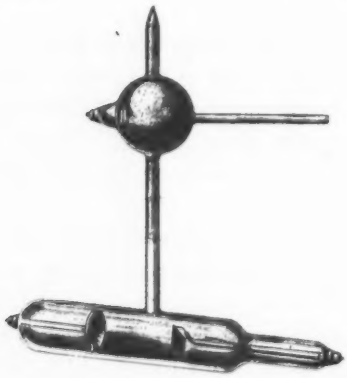


FIG. VI.

offers the possibility of raising as well as lowering the vacuum. They take advantage of the fact that vapor of phosphorus under the influence of an electric current, tends to solidify and attach itself to the walls of the vacuum tube. One electrode you will note is in an auxiliary bulb of the tube; when it is too low this electrode and the cathode are connected up to the induction coil, and the tube is run until it is as high as wanted. When the vacuum is too high the auxiliary bulb is to be heated by a lamp to reduce it. (Fig. VI.)

To all of these forms of tubes there is the objection that they must be continually watched and manipulated, and, what is even more serious, they fail even then to satisfactorily accomplish what is intended except in the hands of very skilful operators.

This is due to the fact that the vacuum in a high vacuum tube is always in a state of unstable equilibrium; when the discharge of a large induction coil is passing through it, it has a tendency to go high or low, and when once it starts to change in either direction will continue with a continually accelerating speed.

In order that the degree of exhaustion should remain constant, it is essential that the temperature of the tube remain constant. This means that the heat generated by the cathode rays striking the platinum and walls must be dissipated into the surrounding atmosphere at the same rate as it is generated. If this is not done the tube will grow either hotter or colder, and the vacuum, as a result, become either higher or lower. More than this, the resistance of the tube to the flow of electrical current varies with the degree of exhaustion, increasing as the height of vacuum increases, and decreasing as the vacuum decreases. Hence, a tube which is growing hotter is also becoming a better and better conductor, more current is flowing through it and the heat is generated more and more rapidly. On the other hand, the tube cooling is becoming a poorer and poorer conductor, and a gradually decreasing amount of heat is generated inside of it. To get the amount of current the induction coil gives nicely proportioned so that the particular tube which is being used will give off heat just as rapidly as it heats up, is one of the most difficult problems that has confronted the user of powerful X-Ray apparatus; in fact, I believe that the best experimenters have adopted the method of using so much current that the tube heats up more than it dissipates heat into the atmosphere, and have then stopped it at intervals to allow it to cool off.

With this introduction I will explain the means which Mr. Sayen has employed to overcome these objections, making use of the two physical properties of high vacuum tubes already referred to,—the increase of resistance with the increasing height of the vacuum and the heating power of the cathode rays.

A reference to the illustration (Fig. VII.) will make the operation of the tube clear. A small bulb containing a chemical which gives off vapor when heated, and re-absorbs it when it cools, is directly connected to the main tube and surrounded by an aux-

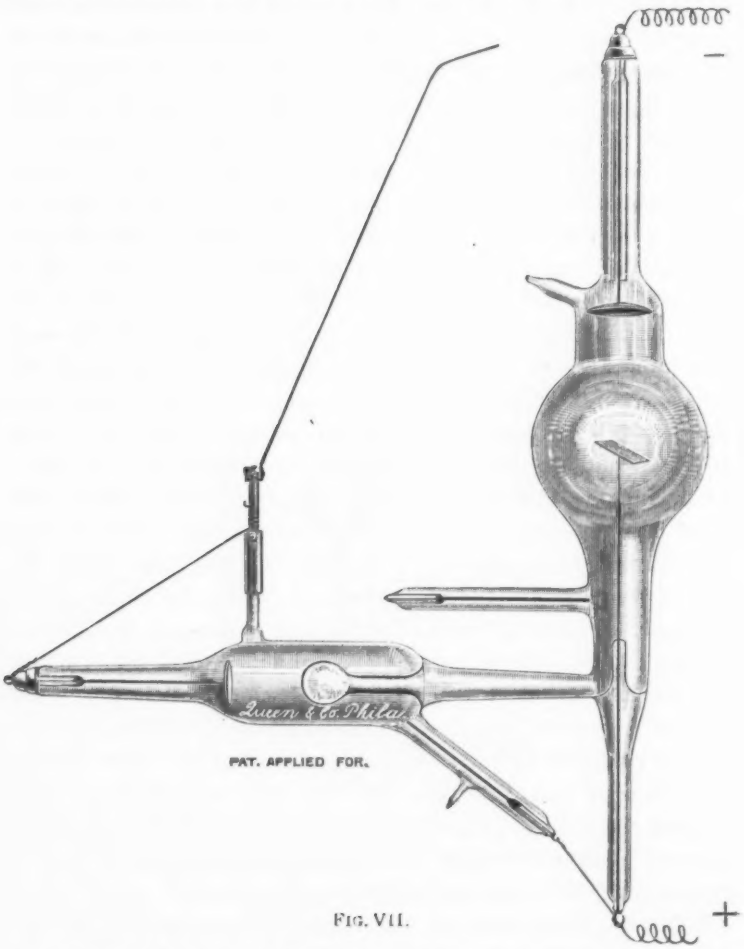


FIG. VII.

iliary tube, which is exhausted to a low Crookes' vacuum. In the auxiliary tube the cathode is opposite to the above-mentioned bulb so that any discharge through it will heat this bulb. The cathode is connected to an adjustable spark point, which may be

placed at any desired distance from the cathode of the main tube. The anode of the small tube is directly connected to the anode of the main tube. The coil is connected as usual to the main tube. When it is put in operation, the vacuum of the tube being high, the resistance is also high, and the current takes the path of least resistance by the spark point and the auxiliary tube, thereby heating the chemical in the small bulb. This will continue for a few seconds until a sufficient amount of vapor has been driven into the main tube to permit the current to go through it. After this only an occasional spark will jump across the gap to maintain the tube at the same vacuum. The vacuum may be set high or low by placing the spark point at a considerable distance from or close to the cathode of the main tube.

After comparison of this tube with a large number of tubes of both domestic and foreign make I believe it is safe to say that it possesses decided advantages over any other form yet described.

First, it has a wider range of usefulness. By a single adjustment it may be set for a high vacuum, when the rays will penetrate through the entire body, and will be in condition to make satisfactory radiographs of the trunk or more specially locate metallic bodies lodged in the trunk; or it may be set for a low vacuum to make radiographs with sharp details and stronger contrast, and showing a trace of the softer parts. One may make the vacuum so high that it is impossible to force any current through the tube, or so low that current will go through the tube rather than jump over a parallel spark gap of ½ inch.

Second, the amount of current which the tube may be made to carry is practically unlimited. It seems to be the general conclusion of recent investigation that the power of X-Rays to affect a fluorescent screen or photographic plate, depends more on the amount of current which the tube is carrying than the length of the spark which the induction coil will give. You will recall that the heating effect is what has heretofore limited tubes in their current carrying capacity. With this tube the initial exhaustion made be made as high as desired, and if used on a large coil the great heat generated in the small bulb will soon bring it down so that the current will go through the main tube, then the small bulb will cool, reabsorbing the vapor as it is

given off by the heating of the platinum and the walls of the tube. It would appear that the only limit to the current-carrying capacity of the tube is the melting point of platinum.

Third, the tube may be run for any length of time at the vacuum at which it is set without the operator giving it any attention.

Fourth, the life is longer than other forms of tubes. Barring accident and misusage, the tube loses its usefulness when its vacuum has become too high. With this tube the only result of increasing height of vacuum is that more current is required to go through the auxiliary tube.—MORRIS E. LEEDS.

SWEDISH SCIENTIFIC VICTORY.

UNDER this title the G. H. T., sometime since, published the following notice: "An application has recently been made to the German Realm for a patent which will attract a good deal of attention in the scientific world, as well as here in Sweden. It is the work of a Swedish scientist, which has been crowned with such success that a theory advanced by him will very soon be brought to positive and practical results. For about a year, the astronomical observer of the University of Uppsala, C. V. L. Charlier, Ph.D., by the aid of a large appropriation from the State has been abroad for the purpose of perfecting a theory which he had conceived for calculating the formula for astronomical and photographic lenses. His researches have now been brought to a successful issue, and he is in a position to calculate the shapes of lenses in a purely analytical manner, which in each instance gives the best possible results.

"Dr. Charlier has also signed a contract with the optical firm of Steinheil u. Söhne in Munich, to calculate for them numerically the ordinary algebraic results. The first result of this adaption is that, which is the subject of the application for patent, and comprises no less than twelve new objectives, each consisting of three lenses, which in their character will surpass all lenses hitherto used for astronomical purposes."

To our inquiry in regard to the above, Dr. Charlier gave us the following very interesting information:

Herschel was the first one who formulated a theory for the calculation for objectives composed of two lenses with the use of all four radii to make the image distinct as possible. But Herschel took into consideration only the nature of the image in the middle of the field, and constructed only objectives composed of two lenses, and at the same time entirely ignored the influence of the thickness and distance between the lenses.

Herschel had no successors. Frauenhofer's objective was constructed on principles which are unknown to his successors.

Neither has Gauss published his method for calculating the objective named after him. It may be added that Petzval probably had invented an analytical method, which he has made known among other matters in his writings for the calculation of his well-known objective, which, according to the opinions of opticians, surpasses (in some respects) all other objectives. But Petzval has not published anything except two popular treatises, and although he had assistance from the State for carrying on his calculations, which, with the aid of several calculators, extended for five or six years, it seems as if he had sold them to the optician Voigtlander.

Generally the opticians have considered their methods as trade secrets. The only exception I know of is the work issued by Steinheil about five years ago (Lehrbuch des Angewandten Optik), in which work he gives an account of his method of calculation.

The opticians may be divided into two classes,—the Steinheil School, including most of the opticians in Europe, and the American School, which latter reduces the mathematical part to the minimum, and constructs objectives in a purely experimental way. That is, a point of light is observed, and the curves are reground until the image appears sharp; a very primitive method, indeed. When the proper shape is approximately known, a good objective for the middle of the field can be made in the above manner. But if it is desired to get the image lying outside of the axis, also well defined, as in all photographic lenses, it will be found a difficult task to accomplish. And if the shapes of the lenses are not approximately known, the method, generally speaking, is of no value. To attempt to discover new formulæ in this manner is evidently lost labor.

The other method, which I have called the Steinheil School, determines the form of the objective somewhot in the following manner: For some reason or other one is led to suppose that the desired objective will, let us say, have about the shape A. This form having been selected, a few rays are calculated trigonometrically, in order to determine whether they all coincide in one point.

If this is not the case, one of the radii is changed, and the form B results.

This is calculated in a similar manner. If the image is not yet satisfactory, one or more radii is changed, and the result is the form C, which again is calculated, and so on.

This method possesses the virtue that it always will make known whether an objective that is tested is good or not, and all such calculations should be made of all ready calculated lenses. But the method is very incomplete.

First of all, a long experience is necessary before one knows what influence the changing of a radius has on the image, and further, if the form is not approximately known, the calculations will require too much time, and proportionally the longer, the greater the number of radii to be determined.

A single objective may thus require years of work, and lastly it may happen that the changing of the radii does not at all correct the errors.

and that the distance between the lenses or the indices of refraction have to be changed to arrive at a good result, and in that case one gropes in the dark.

My task, continues the doctor, was to evolve purely analytical methods for the calculation of objectives.

The errors of objectives can be divided into certain classes which can be treated separately.

Such classes of errors are spherical aberrations, astigmatism, distortion, of the image, etc. For each of these errors a mathematical expression can be obtained. If one wishes to construct an objective free from certain or from all the errors, then the radii, distances, etc., must be so determined that the mathematical expressions equal zero. Thus one comes to simultaneously regard certain equations from which the radii, etc., are to be calculated. The first question now is, How complicated are these equations? It probably is true that these equations have been considered more complicated than they actually are, and that no one before has tried to solve them in a purely analytical way. The equations are, however, not difficult to solve.

I cannot now give the formulæ for expressing errors in the image, and do not consider it necessary in this case.

To illustrate this case I will mention how it shapes itself for an objective composed of two contiguous lenses; that is to say, for ordinary doublets. In this case we have four radii to dispose of, and so four equations to solve. Three are of the first degree in regard to the radii and one equation of the second degree.

Thus we have a mathematical problem which any High School pupil can solve.

If two kinds of glass are given, as for instance, one of crown, and the other of flint, we get (as one equation is of the second degree and the others of the first degree) two solutions with the flint before and two (other) solutions with the crown before.

There are, therefore, four different forms for the objectives composed of two lenses. As expected, the most of these,—that is, three (3),—are already in practical use, and they are:

1. Frauenhofer's form, crown in front.
2. Gauss', also crown in front.
3. Steinheil's, with flint in front.

The fourth form has the concave side towards the object.

The constructions of the four varieties have cost the makers no little trouble, and have been made, as mentioned, all four by one calculation, which occupies about an hour's time. The calculation is not so easy when we have more than two lenses, although the mathematical difficulties generally are not much more.

I have the calculations for the objectives composed of three lenses ready, and they are the subject of the application for patent, which the Swedish journals mention. Being bound by my contract with the Steinheils, I cannot give any information as long as the patent is not issued. The mathematical part of the construction of lenses is a very interesting field.

One is surprised at the many common results to which one can arrive, and it is pleasant to work with the mathematical forms on a ground which is considered mathematically as the most wearisome.—*Fotografisk Tidskrift.*

Translated from the Swedish by A. F. Watch.

OUR ILLUSTRATIONS.

Our frontispiece is a reproduction from a photograph by William H. Rau, of the Washington Monument, erected by the Pennsylvania Society of the Cincinnati, which is to be unveiled in Fairmount Park, Philadelphia, May 15th, 1897.

The photographic print from which the reproduction has been made is most excellent in technical qualities which have been preserved in the admirable halftone engraving, the work of the International Engraving and Illustrating Co., of Philadelphia.

Our other picture, "The Easter Lilies," comes in very appropriately at Easter tide. It is the work of Mr. J. Will. Kellmer, of Hazleton, Pa., and we are glad to have it too, by way of illustrating the papers read at the flower symposium of the members of the Photographic Society of Philadelphia, in January. The picture at that time was the subject of many favorable remarks for its loveliness and delicacy of gradations, rich shadows and soft high lights, and so we have had it reproduced to give our readers some idea of its virtues, but hardly any reproduction can accurately render the beauties of the original print which we understand is Aristo-platin.

We have chosen as a motto for it the words of Ben Jonson—

THE PLANT AND FLOWER OF LIGHT.

"It is not growing like a tree
In bulk, doth make man better be;
Or standing long an oak, three hundred year,
To fall a log at last, dry, bald and sere.
A lily of a day
Is fairer far in May,
Although it fall and die that night—
It was the plant and flower of light—
In small proportions we just beauties see;
And in short measures life may perfect be."

We are in receipt of a sample of Basso Relievo Photography, the work of D. F. Hurlburt, St. Louis, Mo., which possesses much artistic beauty, and displays in an admirable manner the merits of the novel style.

Mr. Hurlburt is prepared to correspond with those who are desirous of introducing his method for Bas Relief. Studio, 923 Olive Street.

COMMUNICATION.

MR. EDITOR :—I notice in your last issue (April) Mr. Eton's employment of Benzoate of Ammonia for toning matteen paper for getting platinum results. This formula calls for—

Chloride of gold .....1 grain.
Benzoate of ammonia .....4 grains.
Water .....20 ounces.

I have used the benzoate of ammonia many years ago (became obsolute), but recently at your suggestion I used it in connection with the chloride of platina bath with finest results, but not the formula published in April number. Some months ago, in conversation the topic turned on experimenting with different salts used for toning, etc., and mention was made about benzoate of ammonia being used many years ago (say thirty-two years) in toning plain salted or albumen paper. The subject prompted an inquiry concerning its keeping qualities after being toned and fixed in the the usual way. I know of a party who has prints in his possession toned in the benzoate of ammonia in 1865, good yet, no perceptible change or fading, perfect blue-black and whites, which was the tone admired in those days, and they were permanent tones, too. I mention this fact, as it gave me the idea to try this on the fine, hard, glossy surface Eclipse paper, now becoming so popular among the photographers (amateurs as well as professional), for ease of manipulation, finest results, uniformity and keeping qualities, which pleased many who used the Eclipse paper during the hot weather last summer, giving them no trouble from discoloration or necessitating use of ice water, alum or hardening of any kind. The Eclipse paper is the best summer paper, and for the benefit of those using it I will give my benzoate of ammonia formula, giving any grade of tone from a sepia to a blue-black, strong clear whites, every detail in the print that is in the negative.

Before toning wash or soak the prints for five or six minutes in

Water .....1 gallon.
Carbonate of soda (sal or wash soda).....1 ounce.

Thoroughly dissolve the soda before putting in the prints, placing them face downwards one at a time and keeping them separated, turn them all well over and keep them in motion for five or six minutes, then pour off the first water, and change your prints in several waters, then let them remain in running water fifteen or twenty minutes, and they are then ready for the toning bath, viz.:

Water .....32 ounces.
Benzoate of ammonia .....80 grains.
Chloride of gold .....1 grain (in solution).

Make up toning bath before commencing to wash your prints. Dissolve benzoate of ammonia before adding the gold. Be sure to have the benzoate of ammonia dissolved before commencing to tone.

Print two or three shades darker than you would like for finished prints.

somewhat darker than for blue-black tones for separate bath, where you use acetate of soda, borax, bicarbonate of soda, or any alkaline salts. No need to test with litmus paper, the formula is test enough.

J. P. DALRYMPLE, Philadelphia (demonstrator Eclipse paper).

[The examples of toning with the benzoate of ammonia which Mr. Dalrymple showed us are rich and pleasing in color, and his formula might be employed with advantage for a variety of tone. It works well with a number of brands of the aristo paper, and we prefer it to the formula we first recommended to him for the employment of the benzoate of ammonia.—EDITOR.]

THE PHOTOGRAPHIC SOCIETY OF PHILADELPHIA.

THE annual meeting of the Society was held on Wednesday evening, April 14th, 1897, the President, Mr. Joseph H. Burroughs, in the chair.

The monthly report of the Board of Directors was submitted, as follows:

Your Board of Directors begs to report that the Rev. Wm. H. Cavanagh has resigned his membership in the Society.

Messrs. Hyacinth Peraldi de Comnène, James Neill Knipe, and Albert Warren Tillinghast have been elected active members.

At the members' meeting, March 24th, 1897, interchange slides from the Toronto and Hamilton Camera Clubs were shown. The set was rather above the average, and was much enjoyed. Slides were also shown by Messrs. G. Wilbur Russell, Wm. H. Rau, Charles L. Mitchell, and L. W. Barringer, Jr.

The visitors' meeting, April 7th, 1897, was a red letter night in the history of the Society. Mrs. C. Stillwell Eldridge, of Radnor, and Mrs. Alfred Paschall, of Doylestown, had consented to show examples of their work, but an informal committee of the ladies of the Society took hold of the program for the evening, and prepared several agreeable surprises for the Society. The lantern represented the work, not only of the two ladies named, but also that of Mrs. Wm. H. Rau, Miss Lulu Rau, Miss Weil, Miss Wood, Miss Vaux, Mrs. Charles Roberts, Mrs. Benj. Sharp, Mrs. Henry T. Brown, Miss Taylor, Mrs. W. H. Roberts, Miss Rothrock, Miss Madge Corlies, and Mrs. Schäffer. At the close of the lantern exhibition, Mrs. Charles Roberts, on behalf of the ladies' committee, presented to the Society a handsome bunting flag for use on future excursions. This was accepted, in an appropriate speech, by the President, and then the members and the guests were served with a bountiful collation.

The admirable work now shown on the wall is the work of Messrs. Carroll S. Tyson, Jr., and Laurence J. Bringle.

Mr. William H. Rau, chairman of the Excursion Committee, made a report relative to the trip to be made to New York, April 27th, on the occasion of the naval review and the Grant Monument dedication. A steamer had been chartered for the day, and the committee expected that a party of forty or fifty would participate.

Mrs. Charles Schäffer and Miss Mary M. Vaux, constituting the "Flag Committee," reported the successful accomplishment of their project to provide the Society with a suitable flag to use on its excursions. The report was accepted, and the committee discharged, with the thanks of the Society.

The annual report of the Board of Directors was presented by the President, and was in part as follows :

Ladies and Gentlemen: In accordance with our custom and the requirements of our By-laws, the Board of Directors present this short statement of the condition of our Society and its progress during the past year.

The matters of most importance are the finances and our membership.

The finances, owing to strict economy, we are glad to say, are in a most satisfactory condition. At the end of our fiscal year, December 31st, 1896, our Treasurer reported a balance of $624.09 (after paying all charges) with which to commence the year 1897. In addition to this the permanent fund stood credited with $1010. That we have so large a balance is due to three causes; first, the giving up of the comparatively useless room used as a library; second, to the generosity of our members, whose donations to cover the deficiency of 1895 considerably exceeded the amount required, and to the fact that we published but one number of our Journal. Your Treasurer's report will be submitted in a separate paper.

Our total membership reported one year ago was 206, to which add new members elected 20, a total of 226. From which must be deducted the following: Dropped 3, resigned 21, our present membership being 202. This membership is made up as follows: Honorary members 2, life members 8, active members 178, absent roll 14, a total of 202.

. . . . . .

The average attendance at our stated meetings has been well maintained. From examination of the Secretary's books, it would appear to be about 50. Your President thinks from what he has seen from his seat, that this is a very conservative estimate. Members and others come in and go out after the meetings have been called to order, and it is almost an impossibility for the Secretary while taking the minutes of the proceedings to note the names of all the members and visitors present.

. . . . . .

The wall displays of prints are a very attractive feature, and should be encouraged. We are indebted to Mrs. Charles Schaffer, Messrs. A. W.

Robinson, Wm. E. Wood, Clarence B. Moore, George W. Norris, Henry G. Peabody, of Boston, and others, for fine collections.

We do not think that the spirit of our annual members' exhibition of prints is fully appreciated. The members should understand that this is not a prize competition limited to faultless prints, but that at least one print is expected from every member, so that we may see what our workers are doing, for our own satisfaction and improvement.

You have now nearly nine months in which to prepare for our next exhibition, and we sincerely hope that we may see an improvement, at least in number of exhibitors, over the display made last January.

One of the features of value has been the exhibition of new apparatus, thus enabling our members to see what may be useful among the many articles that are being brought out.

After reading through the list of subjects that have been brought before this Society during the past year, one cannot but feel impressed with the undue prominence of lantern exhibitions. While these are very enjoyable, and from them we may glean a great many ideas on the part of composition, this is but one division of our object. There are many among our membership who are fully competent to write instructive papers, and we believe that it is only modesty that holds them back.

Mr. George Vaux, Jr., Treasurer, read his report for the fiscal year ending December 31st, 1896. The receipts, including a balance of $160.70 from the previous year, were $2,226.88, and the expenses $1,602.79, leaving a balance on hand of $624.09. The principal fund amounted to $1010. Accompanying the report was the certificate of audit by Dr. Charles Schäffer and Henry Troth.

Applications for election to active membership were received and referred as follows:

Albert G. McElroy, 302 South Broad Street, proposed by Frederick J. Petry.

Winthrop Sargent, Bridewater, Mass., and Union League Club, Philadelphia, proposed by F. Wm. Geisse.

The President appointed as tellers to conduct the annual election, Messrs. Samuel M. Fox and Thomas Wakeman Lane.

Mr. Alexander Hemsley withdrew his name from nomination for director.

The tellers reported that as a result of the ballot the following officers and directors had been elected:

President, Joseph H. Burroughs; Vice-Presidents, Charles R. Pancoast and Robert S. Redfield; Secretary, Edmund Stirling; Treasurer, Anthony W. Robinson; Directors, John C. Browne, Frank Bement, John G. Bullock, Samuel Castner, Jr., F. William Geisse, Horace Howard Furness, Jr., William H. Rau, William H. Roberts, Benjamin Sharp, M.D., Walter P. Stokes, Henry Troth, George Vaux, Jr.

Mr. Wm. E. Partridge gave an entertaining and instructive talk upon "What Photography Can do for Artists." He said he had expressed some ideas upon the above subject in conversation with a member of the Society, and when asked to repeat them at a meeting had agreed to do so. He had not written a paper, but would merely speak from the headings or notes he had jotted down. The subject was one to be approached with great caution, as it was to artists as a red rag to a bull—even the suggestion is dangerous. The artist always disdains all assistance in his work, but he cannot help himself. He gets it unconsciously, if not intentionally. Photographs are now seen everywhere, hanging side by side with the works of the greatest painters. They have taught the world accuracy in seeing the head, accuracy in seeing the landscape, accuracy in seeing facial expression. From it artists have learned, among other things, the complexity of the foreground. There were no great landscape paintings before photography taught artists how to see; and the amazing variety in the portraits of Washington is a sufficient illustration in support of the statement that photography has taught us how to see the human face.

Mr. Partridge went on to inquire, "What is photography?" It is not art, because it cannot give expression to original thought or ideas. We may make a picture in the solid, and the photograph will record it. The speaker's definition was that photography is "history"—to borrow a literary term,—because you make your picture first and then photograph it. He held that photography bears about the same relation to art as copper-plate printing or a ready-made stencil. There is art in posing, in selecting your point of view in a landscape, in the arranging of light and shade, and in grouping, but all this is picture-making, not photography. Photography merely gives us a history of what you have done. Again, you may improve the effect with local toning or retouching or intensifying, but this is not photography—it is only "monkeying with your developer."

Now what can it do if it is not art? Mr. Partridge went on to ask. Let us, he said, make a few negative statements first. Photography cannot take the place of skill of hand, nor of study, nor knowledge, nor legitimate work. It cannot be copied or traced to produce artistic work. But it can gather facts. It tells the story of the reduced scale of light and shade. This was unknown before. Photography makes nature stand and wait for us. She becomes fixed. In topography and architecture it is invaluable. Ten dollars worth of photographs, judiciously selected, will give the student more valuable facts than he could get by making black and white drawings for ten years. In illustration of the value of photography to artists in landscape work Mr. Partridge related one incident in his own experience at Split Rock on Lake Champlain, in which an artist, who scorned to use a camera, brought home after a hard day's work far less than Mr. Partridge's photographs taken from the same point of view. Hours were spent, in gathering facts, which might have been wholly devoted to color, composition effects, etc., which the photograph could not record. The photograph brought back the history—the facts in detail,

and the artist could have been relieved from the drudgery and dealt only with the art. In the same way, in drawing flowers, the photograph gives all the details before "wilting" takes place, and the artist has only to study color from nature.

To most of this all the artists say, Yes; but when I mention the human figure, they object in horror. Mr. Partridge observed in this connection that the greatest objectors usually need photography most. And they all use it in spite of their protests—on the sly. In the study of the nude it is invaluable, catching the pose in its first instant of perfection, catching drapery when it is at its best. For the experienced artist it will catch the almost impossible pose, and allow him to study it at his leisure; and he can study the color of the model in any easy attitude. He can, in a few hours, with photography, get the drawing of fifty poses.

Touching next upon the subject of enlarging and copying, Mr. Partridge said these were sore subjects. Sculptors may measure the model and use proportional dividers; painters may trace a full-size sketch on canvas; the monogram artist even is allowed tracing paper—but photographs, heaven forbid! It is immoral. Perhaps, but its use would immeasurably help some art. Frankly, why should the artist do in a close, laborious way what he can do with equal effect quickly and easily? There is no reason.

In conclusion, Mr. Partridge pointed out that photography cannot give an idea of motion. The eye only sees limbs in motion when they pause on their "dead centres." Motion in a picture is the result of an idea conveyed to the mind—mind is involved quite as much as matter. This is illustrated in the drawings of Mr. F. O. C. Darley, all which show motion. His pictures, the speaker contended, were of more value in the study of the art of representing motion than were Muybridge's. The horse of the camera does not run; he only has a bad case of colic. And, in the same way, the man does not walk. Change the centre of gravity, take the instant when the muscles start for their greatest effort, and the figure moves.

Mr. Partridge's remarks were followed with close attention, and at their conclusion were cordially applauded.

Mr. Edmund Stirling exhibited a print from a negative by Wm. George Oppenheim, of New York, who had courteously sent it for the purpose. It was a cloud study at Casco Bay, made July 29th, 1896, but its remarkable feature was a large disk half hidden by the banks of clouds lying along the horizon. Five negatives were taken at the time, and three of them, it is said, show this strange disk. Mr. Oppenheim has given his assurance that there has been no double printing, and suggests that the image may be due to "some peculiar condition of the air at the time."

Mr. George Vaux, Jr., called attention to the peculiar lighting of the clouds and of the sea. That of the former would indicate that the sun was above the clouds, while the light on the sea appeared to come from the sun close to the horizon.

Mr. Charles R. Pancoast asked whether any information was at hand as to the sort of lens used. If a single combination was employed the disk might be an image of the stop.

Mr. Stirling said the only data he had was that the lens was of about 19 inches focus and the stop f-128.

Mr. William H. Rau said that much the same effect was produced with lenses made prior to 1880, which had insufficient hood flanges. Mr. John P. Anshutz also referred to a similar experience he had had in some interior work.

Mr. Morris E. Leeds then read a valuable paper, and gave a demonstration of "An Adjustable X-ray Tube and Some New X-ray Apparatus" (See page 000).

Adjourned.

EDMUND STIRLING, Secretary.

The Photographers' Club of New England offers for their first Annual Convention and Exhibition, to be held in Boston, July 28th and 29th, the following prizes in the different classes:

Grand Prize.—The Hastings Cup.—Two Genre pictures, 11x14 plate or larger, subject to be chosen by the photographer, the title to be inscribed on each picture, to be framed or not, as the exhibitor may decide.

Class A.—Six or more portraits, pictures to be from 11x14 plate or larger. First, 8x10 Royal Portrait Camera Box, value $50.00; second, one case 20x24 Climax Plates; third, diploma.

Class B.—Twelve or more portraits, pictures to be larger than cabinets and smaller than 11x14. First, Darlot No. 3 Anastigmat Lens, value $45.00. second, one case Stanley 11x14 plates; third, diploma.

Class C.—Twenty-four portraits, cabinets, or some of them smaller. First, Darlot 4-4 Portrait Lens, value $35.00; second, 8x15 Extension Packard Background; third, diploma.

Class D.—Competition limited to cities of 15,000 or under. Eighteen portraits, 11x14 plates or some of them smaller. First, 8x10 Extra Rapid Lloyd Special Lens, value $38.50; second, case 11x14 American plates; third, diploma.

Class E.—Competition limited to cities or towns of 5,000 or under. Eighteen portraits, 8x10 plates or some of them smaller. First, Semi-Centennial Camera Stand, value $25.00; second, case 5x8 American plates; third, diploma.

Class F.—Competition limited to towns of 2,000 or under. Twelve or more portraits, any size. First, Voigtlander Euryscope Lens, No. 00, value $37.50; second, case 5x7 Stanley Plates; third, diploma.

Class G.—Landscapes, with or without figures. Six or more from 6½x8½ plates or larger. First, 6½x8½ View Camera, value $25.00; second, Thornton-Pickard Shutter; third, diploma.

Class H.—Marines. Six or more, from 6½x8½ plates or larger. First, case 11x14 Climax Plates; second, diploma.

Class I.—Architectural. Six or more, from 6½x8½ plates or larger. First, case 20x24 Stanley Plates; second, diploma.

Class J.—Portrait Groups. Two pictures, from 8x10 plates or larger. First, case 14x17 American Plates; second, 25x30 Gold Portrait Frame; third, diploma.

Class K.—Special prize for honorary members in the United States and Canada, outside of New England. One portrait, from 11x14 plate or larger. First, suitable work of art; second, case 8x10 Climax Plates; third, diploma.

Two dollars must accompany the entry for this class, in order to make the exhibitor an honorary member, and eligible to competition.

A diploma for the most tastefully arranged exhibit.

Entries must be made to F. Flodin, Secretary, 476 Main Street, Worcester, Mass., prior to July 14th, as no space will be assigned after that date.

GEO. H. HASTINGS, President.

34 Hayward Place, Boston, Mass.

Boston Camera Club.—The Boston Camera Club, representing a gentleman of high standing in matters pertaining to Aërial Navigation, is authorized to make the following offer of prizes for instantaneous photographs of large soaring birds:

A prize of one hundred dollars is offered by the Boston Camera Club for the best instantaneous photograph of a large bird in the act of soaring.

An additional prize of fifty dollars is offered for the greatest number of instantaneous photographs, offered by one photographer, of large birds in the act of soaring.

By "soaring" is meant the attitude of the bird in the air when no wing motion is apparent.

All contributions should be sent to the Boston Camera Club, 50 Bromfield Street, Boston, Mass., U. S. A., and marked "Cabot Competition."

For further information apply to Mr. Samuel Cabot, care of Boston Camera Club, at above address.

To the Photographers of Pennsylvania: We, the undersigned, photographers of Altoona, are pleased to learn that the first convention at Harrisburg was a grand success, and that Altoona is to have the honor of the convention next year. We desire, through the journals, to say that we shall do our utmost to make you one and all feel at home during your visit to our Mountain City, and the second convention even a greater success than that of this year.

Fraternally,

W. N. BISHOP, GEO. E. HOWARD,
R. A. BONNIE, H. H. DETRICH,
ED. KATTMANN, E. D. BONNIE,
T. M. ROGER, F. W. HART.

BOOK REVIEWS.

"Photographic Amusements." Second edition. Walter E. Woodbury. Mr. Woodbury in his introduction to this pleasant book, quotes the words of Montaigne: "I have gathered me a poesie of other men's flowers of which nothing but the string which binds them is my own." But certainly the collector of these curious quaint and novel fancies of photography has shown much originality in his method of bringing together the diverse subjects, and in presenting to the reader much that is more than amusing; and though the book disclaims any intention of conveying photographic instruction, we are sure the hints and suggestions which are thrown out will not only be found valuable in themselves, but provoke the inquiring student to an investigation of optical as well as photographic phenomena.

An evidence of the popularity of this book is the speedy exhaustion of the first edition, and its appearance in a second. (The Scovill & Adams Company, 60 and 62 East Eleventh Street, New York.)—J. B.

Photography: Its History, Processes, Apparatus, and Materials. By A. Brothers, F.R.A.S. Perhaps there is no modern art so universally used, which, until late years, has been so little understood by laymen as photography. We enjoy the beautiful fruits of photo-lithography presented to us in the periodicals; we marvel at the progress made toward fidelity and artistic charm by photography itself; and we crave, therefore, to know whence come all these miracles of delicate light and shade.

A popular desire always begets its own fulfilment; hence a Manual of Photography has been prepared by A. Brothers, F.R.A.S., which the J. B. Lippincott Company have published in a handsome volume of over three hundred pages, thickly interleaved with pictures illustrative of the various processes described.

It has been the aim of Mr. Brothers to be comprehensive, but at the same time systematic in detail. He gives a very complete sketch of the rise of photography, and of its developments up to the present time. The second chapter of his treatise is devoted to practical information on the Chemistry, Optics, and Light of Photography. Part II. of the work is concerned with the innumerable processes of reproduction which have sprung up about the original art. It forms an exhaustive explanation, so arranged by letter as to be instantly available. After this follow Part III. on Apparatus, and Part IV. on Materials used in Photography. Part V. gives Applications and Practical Hints, after which comes a complete Index.

It would be hard to conceive of a book better suited to its purpose than this thorough manual, and every one, layman or professional, who pursues the art it treats of will find it indispensable for facts, for historical data, and for examples.

"Die Stellung und Beluchtung in der Portrait-Photographie." Dr. Franz Stolze. Second edition, Part 1. Wilhelm Knapp, Halle a. S. In the year 1884-5 Dr. Stolze issued a book on "Photographic Posing and Lighting," but circumstances prevented a contnuation of this work. Now, after a lapse of a dozen years, this eminent photographic authority and journalist again takes up the subject. Part 1 treats of the theory of direct studio exposures, as well as of the artistic features of portraiture. The work is embellished with numerous illustrations of awkward posing contrasted with others where all arrangements are harmonious. The work is issued by the great publishing house of Wilhelm Knapp, of Halle a. S., a fact which is an ample guarantee for the clearness and excellence of the typographical part. J. F. S.

"List of Private Libraries in the United States and Canada." G. Hedeler, Leipzig, Germany. Vol. I. This valuable compilation is published in three parallel columns, in German, French, and English. It gives in detail the description and composition of 600 private libraries in the United States and Canada. It is further supplied with a separate index to the various cities and towns, and subject matter; by reference to the latter, the student is at once enabled to see who is interested in a line of study similar to his own. This book will fill a long-felt want in literary circles. J. F. S.

"Die Photoglyptie, oder der Woodbury-Druck. Von L. Vidal. Translated into German from the French. Wilhelm Knapp, Halle a. S. Heft 25, Encyclopädie der Photographie.

This work is issued as the 25th part of Knapp's Photographic Encyclopedia. It is an exhaustive treatise on the Woodbury process from the pen of Leon Vidal. It is embellished with 24 wood-cuts in the text, and is fully equal to the original French edition. The preface is from the pen of Dr. J. M. Eder. J. F. S.

"Encyklopädie der Photographie." Part 26. Die Dreifarben photographie (the three-color process). By Arthur Freiherrn von Hübl. Wilhelm Knapp, Halle a. S. This work is written with a special reference to the three-color printing process and the production of photographic pigment pictures in natural colors. It contains four colored plates, illustrating the process and theory, and 30 illustrations in the text. The whole subject of "indirect" photography is here handled in an exhaustive manner, commencing with the theory of the vibration of light. The subject of colored light, with the theories of Young-Helmholtz, is touched upon. Body colors and dyes, and their mixing, with a geometrical exposition of the theory, closes the first part. The second part is devoted to the three-color printing process in all its variations. The color theories of Dr. H. W. Vogel, and the relation of the light filterers to the printing colors, as well as sensitizing the plates to suit the various color screens, are practically treated. The various discoveries in this special line from Dr. H. W. Vogel to Carl Zink are well described and commented on. This volume is one of the most interesting of this series; it is issued in uniform style with its predecessors, and is fully up to the standard of the great publishing house from which it emanates. J. F. S.

THE MAGIC AND MYSTERY OF PHOTOGRAPHY.*

BY J. A. RANDALL.

(Continued from February number.)

CARICATURES.—Gross caricatures may be made direct in the camera by photographing the distorted images given by large convex and concave mirrors, such as are sometimes seen outside of eating-houses—No. 1 showing an emaciated individual before dining. No. 2 a second Tichborne after dining. A better method of making caricatures and one admitting of more variety is to draw comical figures of large size upon cardboard, leaving out the heads; a space is then cut where the head should be, and the person of whom a caricature is wanted holds the drawing before him so that his head fits in the aperture. The whole is then photographed, the result being a likeness upon the caricature body of the drawing.

MULTIPLES.—Mirrors will also serve the purpose of taking several views of the same person upon one plate, and with a single exposure. A mirror at the back, with one on each side, will give three positions. A very curious effect can be obtained by taking five views at one exposure. This is done by fixing two large mirrors at an angle so that the junction is not seen; the sitter is placed within the centre of the angle, and by this means four reflections are secured. In the photograph the sitter makes a circle of five, all in the likeness of himself, and the effect is unaccountable.

FREAK PHOTOGRAPHY.—Freak photography is the name given to a method of producing portraits of two heads on a single neck, two bodies on one pair of legs, and other like monstrosities. They are easy of production, being made in the camera by exposing the plate in two parts, and in such a manner that no joining can be seen. This is attended as a rule by dividing the shutter of the dark slide into two, or by making a frame, having two shutters hung like lock gates, to fit in the camera before the plate, and worked from outside the camera. A vertical line is then made on the ground glass and the subject

posed to the left of that line; half the plate is then exposed, the subject shifted to the right of the vertical line, and the other half exposed. If done neatly no line will be visible in the developed plate. The difficulty of the whole matter is making the two halves meet exactly. This depends entirely on the distance of the exposure shutter from the plate, and can only be arrived at by experiment. When found, the vignetting will quite obliterate all signs of a double exposure.

New Heads for Old.—It frequently happens that in taking a group two exposures are made to bring success with certainty. On development it is quite in accord with the general perversity of human affairs to find that in one negative all are very good except the principal person, who has moved badly, whilst in the other all are bad except the important person, who is excellent. Under these circumstances one is apt to groan in spirit and, perhaps, swear in the flesh, if the advantages of combination printing are not recognized; if they are recognized one can afford to smile against the "cussedness" of these things in general and photographic groups in particular. In such cases both groups can be saved—the moved head decapitated, and the unmoved head also decapitated to replace it. In this way every figure in the group may be rendered sharp and distinct.

CORRECTION.

Editor American Journal of Photography:

I beg to call your attention to an error in my paper on "Photographing Lace," published in your American Journal of Photography for April.

It is not a very serious one, however, as the reader will see at once that the dimensions for placing the board and camera have been given by mistake in inches instead of feet. I failed to notice it myself in reading the proof you submitted to me. Anyone will see the impossibility of putting the camera 4 inches from subject, or illuminating with an aperture of only 2½ inches. Page 153, line 9, read 2½ feet; line 10, 4 feet.

Joseph Perry, Jr.

In the Twilight Hour.

There is no little enemy.

He that lives Carnally, won't live eternally.

God works wonders now and then; Behold a Lawyer an honest Man!

"Things out of hope are compass'd oft with venturning."—*Shakespeare.*

Let friendship creep gently to a height; if it rush to it, it may soon run itself out of breath.

"I pity the man who can travel from Dan to Beersheba, and say, 'Tis all barren;' and so it is: and so is all the world to him who will not cultivate the fruit it offers."—*Stein, Sentinental Journey.*

"Life is not an idle ore,
But iron dug from central gloom,
And heated hot with burning fears,
And dipt in baths of hissing tears,
And battered with the shock of doom
To shape and use."

"There is seldom a line of glory written upon the earth's face, but a line of suffering runs parallel with it; and they that read the lustrous syllable of the one, and stoop not to decipher the battered and worn inscription of the other, get the least half of the lesson earth has to give."—*Fabers' Lights and Thoughts on Foreign Churches.*

He who said, in regard to external gifts and blessings, that it is more blessed to give than to receive, meant that profound saying to apply in its fullest extent to all things, and most specially to the affections of the heart. To be loved is precious, but to love is far better. The power of loving is the noblest capacity and purest joy which is known to a human spirit, whatever may be the return that is made to it.—*Rev. Hugh MacMillan.*

"'Tis a part of probability that many improbable things will happen."
—*Arisitotle.*

"The godhead in us wrings our noble deeds
From our reluctant selves."

"Glory is like a circle on the water,
Which never ceases to enlarge itself,
Till by broad spreading it desperse itself to naught."
—*Shakespeare, Henry VI.*

"Conform your life to that of the Supreme Offering made by Supreme Love. Make your sorrow an offering, and when the fire of Divine Charity burns within you, and you behold the need of your fellow-men, by the light of that flame you will not call your offering great.
—*George Eliot "Romola."*

"Oh, Life, without thy chequered scene,
Of right and wrong, of weal and woe,
Success and failure, could a ground
For magnaminity be found;
For faith, 'mid ruined hopes, serene?
Or whence could virtue flow?"
—*Wordsworth.*

"In the checkered area of human experience, the seasons are all mingled as in the Golden Age; fruit and blossoms hang together; in the same moment the sickle is reaping and the seed is sprinkled; one tends the green cluster and another treads the winepress. Nay in each of our lives harvest and springtime are continually one, until Death himself gathers us and sows us anew in his invisible field."

"It is a good and soothfast saw;
Half-roasted never will be raw;
No dough is dried once more to meal
No crock new shapened by the wheel.
You can't turn curds to milk again,
Nor Now, by wishing, back to Then
And having tasted stolen honey.
You can't buy innocence for money."

BARGAIN LIST.—MAY, 1897.

PORTRAIT CAMERAS.

[For Lenses see Special List.]

1—11x14 Scovill Port. Camera, Bonanza holder, ... $35 00
1—11x14 Anthony Port. Camera, Benster holder, ... 30 00
1—11x14 Portrait Camera, with 8x10 attachment, . . . 55 00
1—14x17 D. S. B. Portrait Camera, 40 00
1—5x8 Wet Plate Stereo. Camera, 3 holders, ... 20 00

VIEW CAMERAS.

1—5x7 Eastman R. B. Camera, 3 Holders, Steinheil lens, tripod, 35 00
1—6½x8½ New Model, lens and tripod, ... 9 00
1—5x7 Ideal, 2 extra holders and special case, ... 19 00
1—5x7 Blair, plain back, front focus, lens and tripod, . . . 8 00
1—22x28 American Opt. Co. View Camera, 22x28 Francais lens, 150 00
1—11x14 Flammang R. B. Camera, 4 holders, tripod, Euryscope lens. Prosch shutter, . 100 00
1—5x8 Blair Lucidograph, . . . 4 00
1—4x5 New Model, ... 6 00
1—8x10 Blair, Rev. Back, good order, ... 18 00
1—5x8 Wet Plate Stereo Camera, 1 pair Darlot lenses, 1 5x8 Darlot lenses, ... 10 00
1—4 x 5 New Model Outfit, . . 6 50
1—6½x8½ Novelette Camera, two (2) extra Holders, Beck R, R. Lens, Canvas Case, in good condition. Cost $107.00. Will sell for 60 00
1—4x5 New Model Imp. Camera, Wray lens, 6 extra holders, . 34 00
1—5x8 Genessee Outfit, 3 extra holders 13 00
6—⅝ Scovill light-weight film holders, each 1 00
1—Takiv Magazine Camera, . . 2 50
1—Peep-a-Boo Camera, ... 2 50
1—5x8 Blair Camera, with 6½x8½ extension and 12 holders, . . 25 00
1—6½x8½ View and 2 holders . 8 00
1—5x8 New Model Camera, . . 10 00
1—5x8 Blair Single Swing View Camera 10 00
1—6¼ x 8½ American Optical Co.'s View Camera, ... 15 00
1—5x8 Boston Rev. Back Camera, new, with Orthoscope lens, . $28 00
1—Student Camera, complete . . 1 50

HAND CAMERAS.

1—4x5 Cycle Poco R. B. lens, 6 holders, ... 18 00
1—No. 4 Kodak, good as new, . 30 00
1—Night Hawk Camera, . . . 3 00
1—5x7 Folding Premo, R R lens, 24 00
1—4x5 Waterbury Detective Camera, 3 holders, ... 8 00
1—No. 1 Kodak, ... 5 00
1—5x7 Folding Kodak, new, . 45 00
1—4x5 Turnover Detective, new, 10 00
1—4x5 Climax Detective, new, 10 00
1—6½x8½ Premo Sr, no lens . 28 00

ACCESSORIES.

1—4x5 Roll Holder for Hawk Eye 5 00
6—Scovill Light-weight Holders, each, ... 70
1—Photoscript, ... 2 00
1—Wood Stereo Exposer, . . . 50
3—Cross Collodion Filters, . each 1 00
1—11x14 Glass Bath, ... 2 00
2—12x15 Glass Baths, . . . each 3 00
25—6½x8½ Printing Frames, each 30
2—10x12 " " " 50
2—14x17 " " " 1 25
1—Eastman 4 fold tripod, . . . 4 00
1—Pair large Beam Scales, 14 in., 2 00
1—McKee Embossing Press . . 8 00
1—4¼x5½ Eastman Roll Holder, 2 75
6—5x8 Scovill Film Holders, . . 6 00
1—6x8 Cloud Vignetting Ground, 3 00
1—906, 8x14, Ground . . . 8 00
1—5x6 Burlap Ground 3 00
1—Anthony's Electric Retoucher, 15 00
3¼x4¼ Washing Boxes, each, 50
2—Large Oak Show Frames, each 5 00
1—Cooper Enlarging Bromide Lantern, 5½ in. condenser . 25 00
1—15-in. Improved Eureka Burnisher 25 00
1—Acme Print Trimmer, new, . 9 50
1—Baldwin Print Cutter, new, . 10 00
Lot of Picture Mats. Write for particulars.
1—18x22 Printing Frame, . . . 2 50
1—8x10 Printing Frame, ... 40
1—14x17 Adaptable Washing Box 4 50
2—6x8 Children's Backgrounds, 3 00 and 4 00
1—Wall Accessory, ... 4 00
1—Daisy Foreground, ... 4 00
1—Seavey Swiss Cottage 5 00

1—Osborne's Rock Accessory, .	$8 00
1—Osborne's Pillar Accessory . .	8 00
Lot of second-hand backgrounds, 8x10 and 6x8, $3.00 to $6.00; write for particulars.	
Peerless Varnish Pots, each . . .	40
1—4¼x5½ Negative Box . . .	35
1—Walmsley Reversible Finder .	2 50
1—Card-size Burnisher	3 00
1—22x28 Moorehouse Display Album, ...	9 00
1—Thornton-Pickard T. & I. Shutter, ...	4 00
1—Iron Centre Camera Stand, .	2 50
1—No. 5 Low Shutter, ...	2 50
6—5x7 Perfection Holders, each,	1 00

Bargains in Lenses.

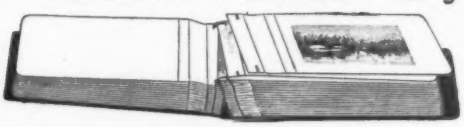
1—14x17 Portrait Lens	25 00
1—No 4, 11x14 Euryscope, . .	45 00
1—11x14 Rapid Rect. Lens, . .	20 00
1—16x20 Rapid Rect. Lens, . .	30 00
1—5x8 Zeiss lens, series 3, . . .	45 00
1—4x4 Voigtlander lens, ...	30 00
1—Imitation Dallmeyer Lens, size 3¼x4¼	6 00
1—No. 1 Gray's Extreme Angle Periscope Lens; list $24.00, .	16 00
1—9 in. focus Ross Portable Symmetrical; list $46.00, ...	30 00
1—8x10 W. A. Lens, ...	10 00
1—8x10 LeClaire Lens, ...	10 00
1—4x5 Bausch & Lomb Shutter, .	$8 00
1—4x5 Gundlach R. R. Star, . .	6 50
1—Krugman's Pat. Cabinet Lens,	18 00
1—11x14 Francais Lens, ...	40 00
1—½ size Voigtlander Portrait .	20 00
1—¼-Size Portrait Lens, ...	4 00
1—¼ Voigtlander Lens, ...	9 00
1—16x20 Darlot W. A.	35 00
1—6½x8½ Gundlach and Shutter,	45 00
1—Extra 4x4 Harrison Portrait.	20 00
1—¼ H B and H Lens, ...	3 00
1—½-Size Dallmeyer lens for cabinets, ...	50 00
1—5x7 Euryscope Lens, Prosch Shutter; list $50.00, ...	30 00
1—6½x8½ Gundlach Single Lens	3 50
1—5x8 Gundlach Star Lens, . .	12 00
1—5x8 Darlot R. H. Lens, . . .	15 00
2—4x5 Darlot R. H. Lens, each	8 00
1—10x12 Blair Orthographic, . .	18 00
1—5x8 Wide Angle Lens, . . .	5 00
1—6½x8½ Wide Angle Lens,	8 00
1—Pair Waterbury Stereo Lenses,	4 50
1—R. R. Detective Camera Lens, 3¼x4¼, ...	3 00
1—¼ Gem Lens, ...	1 50
1—4-4 Jamin Globe Lens, . . .	12 00
1—¼ Holmes, Booth & Hayden,	4 00
1—8x10 Portrait Orthoscope, . .	20 00

Terms: Net Cash. *Lenses will be sent with privilege of trial.*

THOS. H. McCOLLIN & CO.,

1030 Arch Street, Philadelphia.

THE NEW GILSON ADJUSTABLE ALBUM



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This is the album for the Amateur Photographer and Photograph Collector. There are no disappointing blank leaves. It can be expanded or contracted at will by simply loosening a silk cord. Equally adapted to small gift collections, or large home collections. All sizes and styles of leaves or bindings.

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THOS. H. McCOLLIN & CO.'S

Professional Flash Lamp

PATENTED.

Used with Blitz Pulver.

FOR PORTRAITS, LARGE GROUPS, INTERIORS AND STAGE EFFECTS.

Takes the place of daylight on dull days, takes the place of a skylight on bright days.

As manufacturers of Blitz Pulver, which is used by all manufacturers of Professional Flash Machines, we feel that we are in a position to know what photographers want.

We believe FLASH LIGHT WORK HAS COME TO STAY, and after careful experimentation, we have produced a lamp which combines SIMPLICITY, ECONOMY AND EFFICIENCY. We invite correspondence from photographers, and will publish from time to time samples of the work of the machine in this journal.

This machine requires no gas or gasoline,—burns alcohol,—and is used with Blitz Pulver exclusively. The cut will show its construction.

Thos. H. McCollin & Co.

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ASK YOUR DEALER FOR FORMULAE.

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WIDE ANGLE.

RAPID RECTILINEAR, EMBRACING AN ANGLE OF 75°

	Size of Plate.	Focal Length.	Price.
No. 1, Rapid Rectilinear,	4 x 5	6 inches	$10.00
2, " "	5 x 8	8½ "	15.00
3, " "	8 x 10	11½ "	20.00
4, " "	11 x 14	16 "	30.00

WIDE ANGLE RECTILINEAR, EMBRACING AN ANGLE OF 90°.

	Size of Plate.	Focal Length.	Price.
No. 1, Wide Angle,	5 x 8	4¾ inches	$10.00
2, " "	6½ x 8½	6 "	15.00

Perfectly Rectilinear. Quick Acting. Every Lens Guaranteed

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Though but recently introduced, these lenses have given such universal satisfaction that we have no hesitation in recommending them as the best in the market.

They are specially adapted for Portraits, Groups, Landscapes, or Instantaneous Subjects, working sharp to the edge.

The stops for these are cut to the standard sizes of the British Photographic Society.

	Diameter.	Focus.	Size.	Price.
No. 3,	$1\frac{5}{16}$ inches	7½ inches	5 x 7	$20.00
4,	$1\frac{11}{16}$ "	10¼ "	6½ x 8½	25.00
5,	$2\frac{1}{8}$ "	12½ "	8 x 10	30.00
6,	$2\frac{11}{16}$ "	19½ "	12 x 15	50.00
7,	$3\frac{3}{4}$ "	23 "	16 x 20	75.00

WILL BE SENT ON TRIAL ON RECEIPT OF PRICE

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Has a record for flash-light work which is unapproached. No other powder in the United States can show the indorsements of every individual manufacturer of professional flash-lamp which are successfully on the market. Read what they say of it, and then judge. Do not deceive yourself. Flash-light work has come to stay.

ST. JOSEPH, MO., October 6, 1894.

Thos. H. McCollin & Co.

Messrs.:—In regard to your inquiry I will say, I advise the use of "Blitz Pulver" with our machine, and I have used no her powder in getting out our sample negatives. operates in our machine with unvarying success.

Very respectfully yours,
L. G. BIGELOW.

BRIDGEPORT, CONN., October 17, 1894.

Thos. H. McCollin & Co.

Gentlemen:—We have tried various compounds for flash light powders now on the market, but yours gives the best satisfaction with our machine.

Yours truly,
FAIRCHILD FLASH LIGHT CONCERN.

SAN FRANCISCO, CAL., February 16, 1894.

Gentlemen:—In regard to Blitz Pulver we have ways recommended your powder, and our instructions call for it and no other. It is the best powder we ave ever used.

[Signed] WILLIAMS & SHEPARD,
Manufacturers Williams Flash Machine.

CORTLAND, N. Y., October 8, 1894.

Thos. H. McCollin & Co., Philadelphia.

Gentlemen:—Will say in regard to "Blitz Pulver" that it is the only flash powder of which we have any knowledge that can be relied upon at all times. We send it out and advise its use with the *Westcott* Flash Machine. When used with this machine it produces beautiful results and with very little smoke.

Respectfully,
WESTCOTT & LEWIS.

MUSCATINE, IA., October 5, 1894.

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Dear Sirs:—We manufacture and sell flash light machines and of all powders we have used find none to compare with Blitz Pulver. We have used it for for all kinds of work, big heads, full forms, opera house stages and interiors, and always find it reliable and quick acting.

Yours respectfully,
CLIFFORD & SON.

Price, 60 cents per ounce.

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HIGGINS' IMPROVED ADHESIVES

PATENTED

December 29th, 1891 (3 Patents).
March 15th, 1892. Sept. 17th, 1895.

BEWARE OF IMITATIONS AND INFRINGEMEN S.

SPECIAL NOTE TO DEALERS.

Another Carter Fallacy Exposed

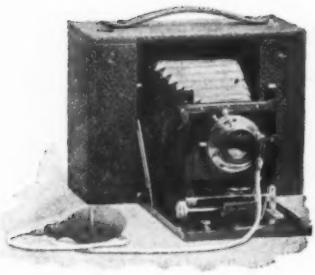
FALSE SYMPATHY and "FALSE IMPRESSIONS"

There is one point in the manifesto of the Carter Ink Company of December 29, 1896, addressed to "Dealers in and Consumers of Paste," which we have not heretofore noticed, and which we now wish to fully answer.

In one paragraph of this manifesto Brother Carter tries to get up a false sympathy for infringing dealers by hinting at our "unfairness" in "*seeking to place the burden of infringement on dealers manifestly unconscious of it.*" Now, *we* have placed no burden of infringement on unconscious dealers, nor are we keeping up any false impressions. On the contrary, it is the *infringing manufacturer* who persuades an innocent dealer to sell his infringing goods, in defiance of our rights, that places such burdens on the dealer, and thus involves the dealer with himself and keeps him under *a false impression of security.* We have been diligently trying to take this burden off the dealer by carefully informing him of our rights and the risk he runs by thus involving himself with the infringing manufacturer. One dealer whom we carefully so warned, and who still persisted in ignoring our rights, we have brought suit against. Is this what Brother Carter calls "*putting a burden of infringement on a* MANIFESTLY UNCONSCIOUS dealer," and "*keeping up a* FALSE IMPRESSION?" It seems to us that the misguided dealer had received *this burden from some one else*, and also *the false impression that he was safe and that we did not mean what we said.*

Now, it is obvious that a dealer who continues to sell infringing goods after due, specific and careful warning, and in defiance of a patentee, is just the same as the infringing manufacturer. The law recognizes no difference, and neither does Morals nor Common Sense, and it is merely a question of expediency for the patentee to decide which he shall sue, and we have carefully explained in former notices why we have brought suit against such a fully conscious dealer.

Brother Carter also refers to the "*rights of the dealer*," and that he should "*insist on his rights*," etc. Now, of course, any dealer has the free and full right to question any patent issued by the United States as he may think proper, but this does not in the least affect the right of the patentee to sue him if he infringes the patent by selling the patented goods. We, therefore, do not imagine that dealers generally, under Brother Carter's advice, will be very anxious to avail themselves of this right, for reasons of justice to the patentee and prudence to themselves. We, therefore, believe that Brother Carter's *false sympathy* is wasted, and is nothing but *legal and moral nonsense* and may be safely interpreted as only a form of *selfish sympathy for himself.*



Cartridge Kodaks.

The adaptation of our Film Cartridge System, by which the camera

LOADS IN DAYLIGHT,

to a Folding Kodak of the highest type marks the latest achievement in camera construction.

The Cartridge Kodak embodies in an instrument only 3⅛ inches in thickness, every feature which the skilled amateur desires in his camera. It uses either Film Cartridges or glass plates and is the only camera capable of making 4 x 5 pictures which is

ADAPTED TO USE AWHEEL.

Can be carried in a bicycle case which clamps within the frame or to the head.

Price No. 4 Cartridge Kodak for 4 x 5 pictures, with Rapid Rectilinear lens and pneumatic shutter having iris diaphragm stops (not loaded),	$25.00
Film Cartridge, 12 exposures, 4 x 5,	.90
Bicycle Carrying Case to attach inside frame or to head,	2.50
Washers to hold case in front of brake rod, when used on head,	.50

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Rochester, N. Y.

BICYCLE KODAKS.
$5.00, $8.00, $10.00, $25.00.
Free booklet tells all about them.

Solio Guaranteed Only in Original Packages.

Solio that has been repacked must of necessity have been exposed to the air and very likely to a considerable amount of light and dust which would cause it to deteriorate. Being repacked by inexperienced hands who have not the conveniences to be found in our factory, it is more than likely to be soiled and injured by finger marks. It will rarely give the perfect results to be obtained from paper purchased in the original package.

Solio that has been repacked may be older than the date on the package indicates. Repacking is one way of getting rid of old paper. Buy your Solio in the original package and you will **know** how old it is. Our guarantee does not cover Solio in any but the original sealed packages put up by us.

Solio that has been repacked may not be Solio at all, but a cheap substitute. Buy in original packages only and get:

SOLIO
Fresh SOLIO
Uninjured SOLIO.

Insist on having an original package. Repacked Solio cannot be "Just As Good." It may not be Solio at all.

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Wonderful Keeping Qualities.

A Ten Year Old Package of Eastman's Permanent Bromide Paper Gives Perfect Results.

BUFFALO, N. Y., Jan. 25th, 1897.

EASTMAN KODAK CO., Rochester, N. Y.

Gentlemen:

Have heard many arguments, pro and con, regarding the keeping qualities of "Bromide" paper. Have seen many cases where the paper was condemned, but usually found that the fault lay either in the developer or with the party handling it.

The desire to experiment with some good old emulsion grew stronger and stronger, until fortune smiled upon me at last, when I found two very old packages—"Permanent Bromide," emulsion numbers 50* and 674*. It is unnecessary to look for the date of coating, as any one familiar with the paper can judge for himself; besides No. 50 speaks for itself.

The prints forwarded you tell their own tale; cannot say that I have ever obtained finer results from the very freshest paper; the pure whites, soft, velvety blacks and fine detail in the shadows, are certainly all that can be desired. It does seem to be a "Permanent" Bromide.

Congratulating you upon the wonderful keeping qualities of your paper, I remain,

Yours truly,

101 Orange St. PHIL. J. KNAPP.

Eastman's "Permanent Bromide Paper" Is Permanent.

EASTMAN KODAK CO.

Rochester, N. Y.

★ *Emulsion No. 50 was coated in 1886. No. 674 in 1888.* *EASTMAN KODAK CO.*

Alfred J. Ferris, Printer, 29 North Seventh Street, Philadelphia